MAY 2, 1960

American Machinist / Metalworking Manufacturing

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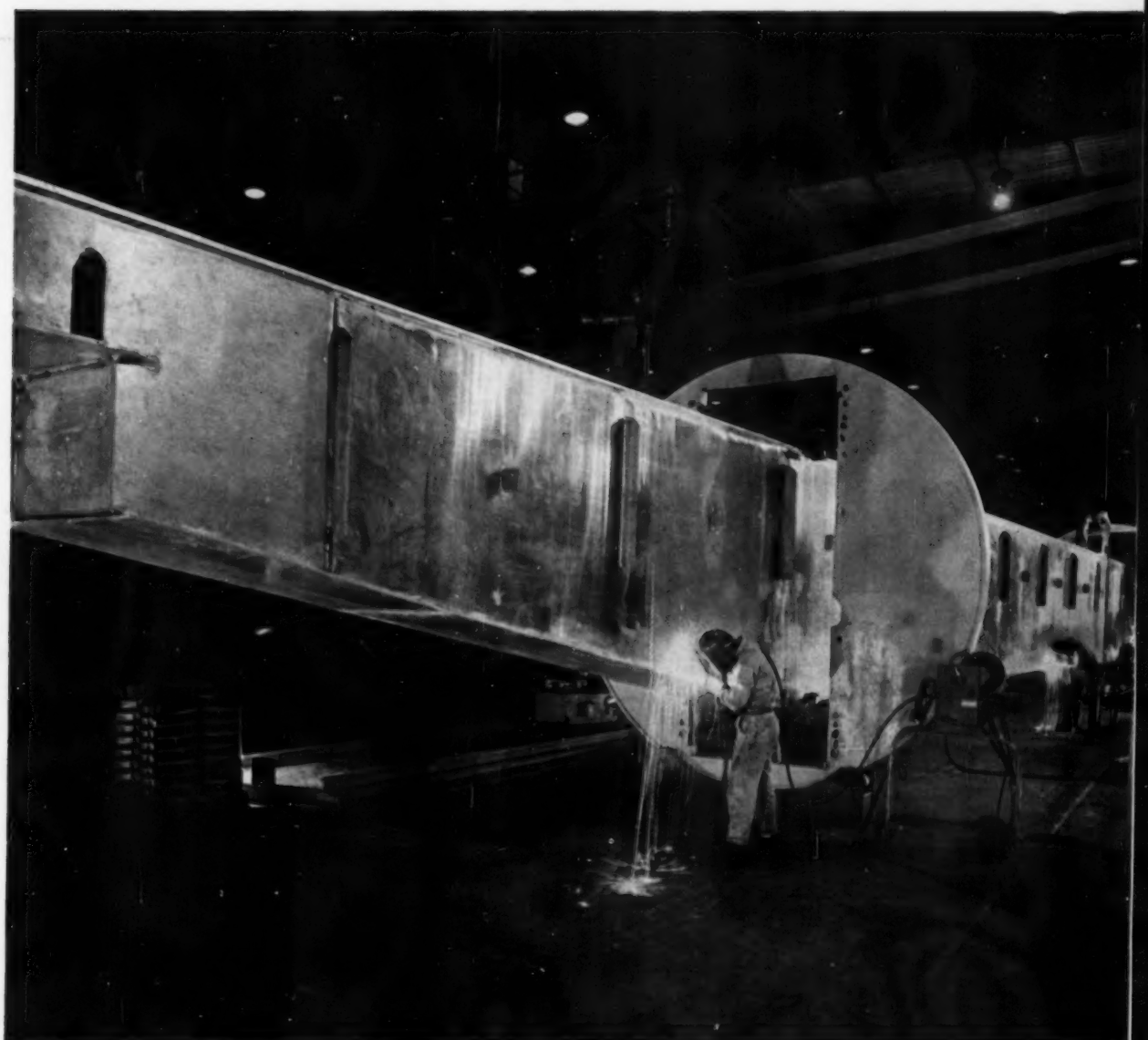
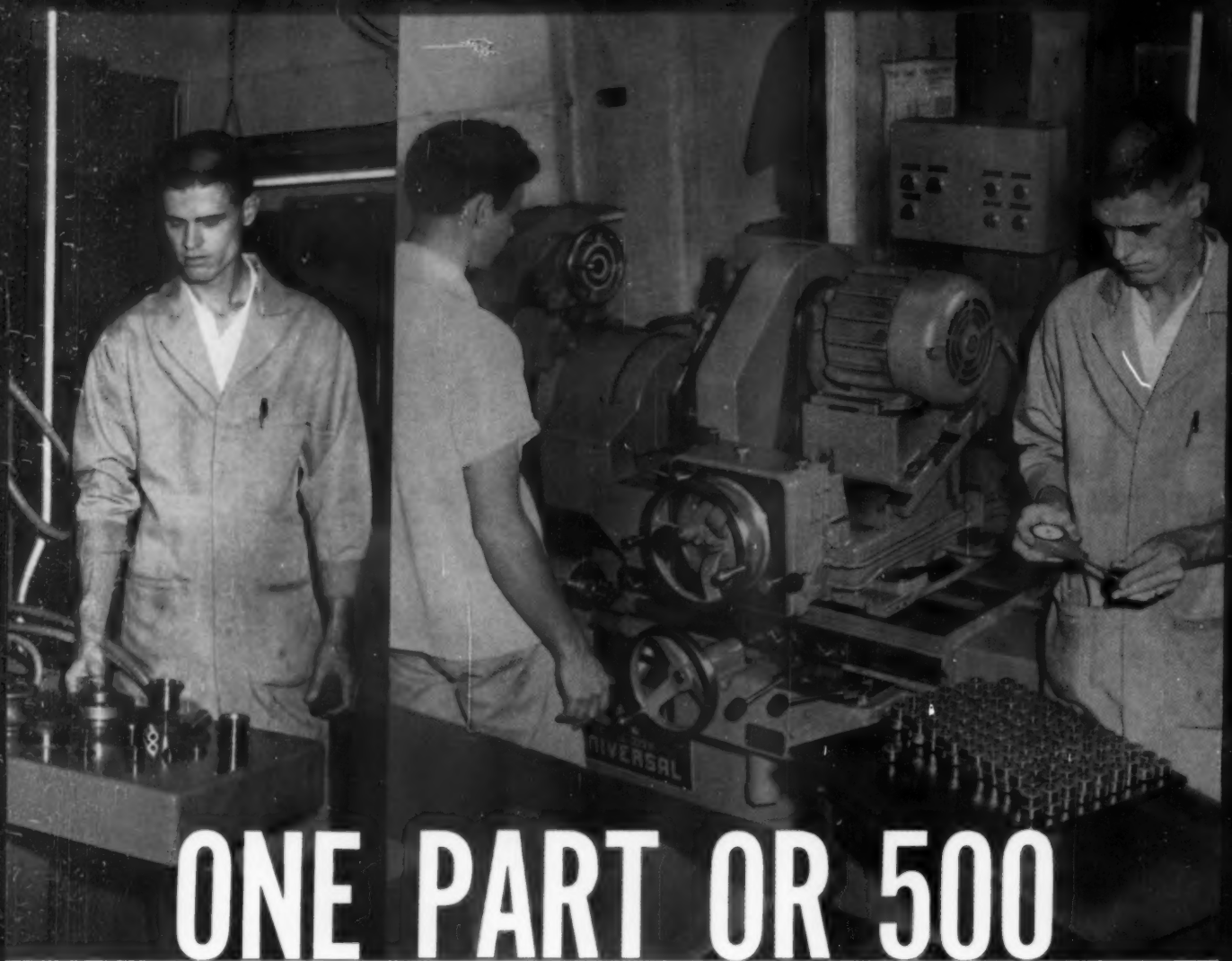


Aluminum girder 107 feet long is welded for giant crane—see page 1

Simple Loaders for Short Runs

Special Report, page 107



ONE PART OR 500

Selco gets top grinding performance at rock-bottom cost with the

NEW HEALD MODEL 273A UNIVERSAL

The Heald Model 273A Universal Internal Grinder shown above is installed at the Selco Grinding Company — a small but busy job shop in southern California. Here it is used to grind straight or tapered I.D.s and O.D.s, and for rotary surface grinding of flat, convex or concave surfaces of a wide range of work — from individual parts to production runs. And it easily handles every job with far greater speed, accuracy, precision and finer finish than could be obtained on any of their previous equipment.

Until the advent of this Universal Grinder, most small job shops (and many larger ones, too) couldn't afford a machine of this type. But the Heald 273A costs about *half* as much as comparable machines today, and less than similar machines (with fewer features) cost in 1947!

Incorporating the latest advances in the grinding art, it holds tolerances to within .0001" in routine production, and within .000050" in special cases. Features include hydrostatic antifriction ways, full 20" table travel, several wheelhead positions, infinitely variable workhead speed from 150 to 450 rpm and 90 degree workhead swivel for rotary surface grinding.

Ask your Heald engineer for information on the New 273A — the only completely new machine with 1959 performance and a 1947 price tag.

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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HEALD

It PAYS To Come To Heald

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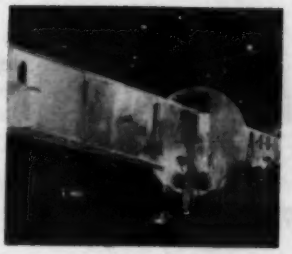
Cover:

107-ft girder for aluminum bridge crane in final assembly at P & H Harnischfeger Corp before being shipped to Kaiser Aluminum Co's Ravenswood plant. See p94



American Machinist / *Metalworking Manufacturing*

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TURN PAGE FOR METALWORKING REPORT ⟶

METALWORKING REPORT

Significant current developments in tooling and production processes

CUTTING

Sub-Zero Machining

Tool life can be increased 300% in turning H11 hot-work tool steel by applying CO_2 mist. This is one of the more impressive savings found in extensive tests of sub-zero machining conducted by Convair for the Air Materiel Command. End milling of R-235 steel with CO_2 mist increased tool life 100%. Drilling and tapping were also studied.

Three methods of cooling were tested on several hard-to-machine metals. Cooling with mist at –109 F and flooding with coolant at –76 F were each more effective than deep-freezing the part itself.

Materials tested were A-286, L-605, R-235, H11, and Mo-0.5Ti. A detailed summary of the test results will be published as soon as possible.

Big Magnetic Drill

A portable magnetic-base drill that will cut holes up to 1½ in. in steel —and larger with adapters—has been announced by Guibert Steel Co, Pittsburgh. It weighs 750 lb, has a 1-ton holding magnet, and 5-hp motor with 4-speed gear shift. Operations include drilling, reaming, and countersinking.

The unit is built largely with aluminum castings and stainless steel to reduce corrosion problems, and to keep weight low. It is controlled by one man. A typical job is to drill ¹ 1/16-in. holes through 1-in. steel plate in 27 seconds, including time to move from one hole to the next.

FORMING

Sonic Waves for Forming

Considerable energy can be induced in a part being formed by superimposing the waves on the mechanical forming energy. William W Wood, supervisor, manufacturing research, Vought Aeronautics Div, Chance Vought Aircraft, referred to this work at the recent ASTME meeting in Detroit. With an assumed mass of 10^{-8} lb for the moving wave front and a velocity of the ultrasonic wave in steel of 17.5×10^6 ft/sec, the superimposed kinetic energy would be 50,000 ft-lb.

Mr Wood classes this high-energy forming method as a variant of the methods in which energy in the form of high temperature is added to the mechanical forming energy. For further news of the ASTME meeting and the Tool Show, see page 95.

Upset Ten Times Faster

Torsion bars for a German automobile are being upset on each end at the rate of 1000 pc per hr on a new automatic forging line. This rate is ten times faster than achieved with the former manual-feed system.

The automatic line consists of induction equipment for heating the bar ends, a ratchet feeder, two 200-ton Eumuco horizontal forging machines, and conveyors. The bar is upset on one end by the first machine, then conveyed to the second machine for deforming the other end.

Work flow is expdited by "open-end" construction of the forging machines. The gripping dies out front on a carriage are partitioned in the horizontal plane, which aids bar delivery from a ratchet feeder or conveyor. Walking-beam conveyors transport the bars horizontally or vertically between gripping stations. There can be as many as six impressions in the dies. Gripper dies are actuated by a toggle mechanism.

Several of these forging machines have been installed in the United States for forging jet-engine turbine buckets, and for cold forging and coining. They feature a longer gather and strip-off than is common. The machines are built by Eumuco AG, Leverkusen-Schlebusch, West Germany. General agent for the US and Canada is Richard E Kleinhans, 122 E 42nd St, New York 17.

INSPECTION

Bore Characteristics

Optical inspection of long bores and checking of plating thickness in small bores have recently been investigated anew by two organizations.

To gain a detailed interior view of bores of 2 in. or more in diameter, and up to 30 ft long, Aerojet-General Corp, Azusa, California, developed an optical checker. Designed for viewing the interior of the grain bore for solid rocket motors, the device can also be used in a portable version for probing pipes, tanks, airplane wings or any irregular enclosure with a hard-to-get-at interior.

The optical grain checker features a safe external light source, a mirror which is driven along a slotted optical tube, and a specially designed telescope to magnify the image reflected by the mirror.

Measurement of the thickness of chromium plating in 30- and 50-cal gun barrels prompted the National Bureau of Standards, Washington, to develop two miniaturized gages for the Army. These gages make use of the reflected field from eddy currents induced in the gun barrel or tube.

These miniaturized gages supply information that was formerly lacking. If the plating anode is not concentric with the bore, the plating thickness is not uniform. This situation could not be detected by the customary measurement of the bore before and after plating.

Proximity Measurements

Measurements as close as 10 millionths of an inch can be made by a capacitative proximity transducer just announced by Stewart-Warner Electronics, Chicago. It will measure parts made from any material that has a dielectric constant, including ferrous and nonferrous metals and plastics.

Precision of measurement varies inversely with the square of the distance between the sensing head

and the surface being checked. Unit is not affected by variations in temperature or humidity and, in field tests, it has operated satisfactorily through heavy films of oil, paint, water, oxides, and mill scale.

In its first application, as a height controller for flame cutting torches, it holds the torch-tip-to-plate distance within 1/32 in. when the sensing head is supported ¼ in. above the plate.

HEAT TREATING

New Heating Element Alloy

Increasing use of atmospheres in heat-treating operations has spurred the search for a heating element material capable of resisting corrosion, carburization, and "green rot" over the entire range of operating temperatures.

Hoskins Manufacturing Co, Detroit, Mich, after a 5-year metallurgical R&D project, has announced the availability of Chromel-AA, a modified 80-20 nickel-chromium resistance alloy reported to show optimum characteristics up to 2150 F. The new alloy contains minor percentages of iron, silicon, cobalt, manganese, and columbium, and it is these additions that give it its outstanding properties.

Chromel-AA is reported to have improved high-temperature resistance to corrosion in reducing atmospheres, it is highly resistant to attack from sulfur, chlorine, and other contaminants sometimes present in controlled atmospheres. Moreover, it is not susceptible to green rot—a preferential intergranular oxidation of the chromium in the temperature range 1500-1800 F.

WELDING

Low-Temperature Joining

Monel metal and beryllium copper are being joined at a temperature of 650 F by a diffusion bonding—or diffusion welding—technique developed at Battelle Memorial Institute, Columbus, Ohio. Other metals, similar and dissimilar, are also joined at surprisingly low temperatures and can withstand service temperatures well above the bonding temperature.

Key to the process, says D C Martin, welding technologist, is that intermediate metals are plated on the parts to be joined before they are put in the oven. These metals make it possible to join the parts at temperatures far below those which would be required for direct pressure bonding of such materials.

Intermediate metals for the Monel-to-beryllium-copper joint were silver and copper. The bonding temperature of 650 F was also the age-hardening temperature for the beryllium copper, so the technique killed two birds with one stone.

THE OUTLOOK.

Metalworking production, as measured by the AM/MM Index of Metalworking Production, is steady at 108, and this picture is reflected in reports from around the country. See page 87. But things should pick up in the near future when industry puts its capital spending plans into full swing. Metalworking plans to spend $4.52 billion; business, taken as a whole, plans to spend $37.9 billion. See p93.

ASSEMBLY

Welded Electronic Circuits

A definite breakthrough in welding conductors will make possible all-welded radio and tv circuits. The technique, described by William L Hughes, General Electric Co, at the AWS meeting in Los Angeles last week, depends on nickel-clad copper conductors, which can now be welded to terminals and to solder-clad pigtail leads on components.

This is resistance cross-wire welding, which will withstand high temperatures and have much more strength than soldered connections. The process has been under consideration for several years, but not applied because of the difficulty of welding tinned copper, brass, and other metals.

Nickel-clad copper can also be brazed to the dumet lead wires commonly applied to miniature glass diodes and transistors. The copper plate on the dumet becomes the brazing filler metal. Similarly, when tinned brass wire is brazed to nickel-clad copper, the brass becomes its own filler metal. Tensile tests indicate values of 80-90% of that for the parent metal, even in the brazed joints. A joint can be welded in 3 milliseconds.

Automatic Instrument Assembly

Automatic assembly of manometers has been claimed by Russia, based on a prototype "rotor" machine (probably a turret or turntable) designed and built by "Scientific-technological Research Institute for Instrument Design" of Moscow.

The announcement claims double work productivity with the "system of rotors"—four of them connected by materials-handling equipment. Some 15 parts are joined.

Assembly includes some machining and subassembly. Economic gain is said to be an hourly output of 720 units compared to 30 units by hand assembly.

FINISHING

Ultrasonics Aid Cleaning

High-volume, low-cost uses of ultrasonic pickling and degreasing are in the offing. Pickling of wire, bar and strip is one application now being developed by Wean Equipment Co, Pittsburgh, and Branson Ultrasonics Corp, Stamford, Conn.

To pickle 40-ft-long hot-rolled bars, a bundle is dropped on a loader that feeds them one by one to notches in a rotating drum. This drum is partially surrounded by shoes to contain the bar ends while the bars are exposed to pickling acid that is agitated ultrasonically. The operation can be conducted in 10% of the time for a normal acid pickle. Removal of scale is much better and space is conserved. Installations are expected at steel mills, warehouses and large users of bar stock.

For large existing degreasing machines, cleaning efficiency and speed can be up-graded by installation of packaged transducer units.

Greater efficiency and economy in cleaning is promoted by Branson's development of a laminated transducer incorporating lead zirconate titanate. This ceramic operates at 25 kc, is 90% efficient in converting electrical energy to ultrasonic energy in the cleaning solution, may be operated at a higher bath temperature (200 F), and allows replacement of housings at 20% of the cost required with the ceramic formerly available.

If higher bath temperatures are required, as in pickling, a double-boiler technique is now employed. The stainless-housed transducers are placed in a water bath between the outer jacket and the inner, removable stainless-steel work container. The latter is heated by steam.

METALWORKING REPORT . . .

MATERIALS & COMPONENTS

Contoured Metal Honeycomb

All-metal honeycomb in practically any shape and size, with simple or compound curves, can be produced by a new process developed by Allied Research & Engineering Div, Los Angeles. At present, the material is available in high-purity nickel for heat and corrosion resistance. Its melting point is 2651 F.

Process is reported to be metallic deposition through electroforming. The result is a single material, free of any low-temperature brazed joints. Load bearings can be inserted, and cell size can be varied, even within the same structure. Material can be welded by conventional techniques. Stock can be as thin as 0.0005 in., but wall and cell layers do not have to be the same gage.

Less Curing for Plastic

A moderate-temperature curing cycle for laminating plastics, developed by Narmco Industries, Costa Mesa, Calif, makes die construction simpler and quicker. The material is Conolon 506, a glass cloth impregnated with modified phenolic resin that is partly cured in the sheet.

The cloth is laid up, over a model or a die, then cured for a fairly short time at 275 F. This compares to normal curing temperature of 350 F.

Strength of the cured plastic is 64,000 psi flexural and 37,000 psi compressive. It will stand temperature shock of 1000 F with little damage, and at 500 F is still 25% stronger than required by military specifications.

Lower curing temperature simplifies production and means less chance for temperature distortion of the shape being molded.

MATERIALS HANDLING

Standardized Containers

One of the best ways to cut handling costs is to standardize containers. Two recent developments prove it:

At Marietta, Ga, Lockheed Aircraft's Special Products Div has designed and is building what it calls cargo capsules. These 175-lb aluminum containers are currently in service on PanAm's Boeing 707 jets. With the new capsule cargo system, 4½ tons can be loaded or unloaded in less than 10 minutes.

In addition to the capsules, the system includes two roller-bearing platforms used with ground handling equipment, a switching platform, and roller-bearing tracks in the aircraft's cargo area.

If you ship air freight, the capsules should be of real interest. They can be loaded directly from assembly lines, cutting handling and packaging costs.

Second container idea originates from the San Francisco Naval Shipyard, where a Value Engineering group has developed a modular bin that is assembled with small flat bars and a special "U" clip. Large quantities of these bins—which come in six types—have been ordered for use on ship and shore facilities. Savings to date with the new modular bin add up to about $65,000.

MANUFACTURING CONTROL

Juke-Box Storage File

Computer data can now be stored in a machine that looks remarkably like the modern nickelodeon (without the neon). Called the quick-change disk file, the unit holds up to 128 disks that have magnetic recordings on each side. Capacity of these metal disks—the same size and shape as familiar plastic 45-rpm records—is 4½ million characters.

The new file is part of RCA's recently announced 301 computer system, designed for relatively low-cost operation. Up to five disk files can be fitted into the system, giving a total capacity of over 23-million characters.

To get information from one of the disks, which are arranged on a wheel, the computer operator selects the proper disk for playback, just as if he were selecting a hit tune. Data transfer rate is 2500 characters a second. With two of the disk files incorporated in the computer system, about 1200 interrogations or 800 file updatings are possible per hour. Individual disks may be quickly interchanged manually for new programs and operations.

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. . . on new Cincinnati Milling Machines!

There's a new influence in milling machine productivity—*the spindle nose!* ARBOR-LOC is the name. It's a standard feature-advantage on more than 70 sizes and styles of CINCINNATIS, whereby arbors are changed *at the spindle nose*. Here are the facts:

1. Quicker. Within a few seconds, arbors are changed for a new setup or operation.
2. Safer. No need for the operator to go around behind the machine, or climb up on the table of vertical millers to tighten a draw-in bolt.
3. Standard spindle nose. ARBOR-LOC is supplied at no extra cost on 77 CINCINNATI Milling Machines.
4. Reduces inventory of accessory equipment. Standard arbors and collets (made by Cincinnati) fit the new ARBOR-LOC spindle nose.

Get complete information on CINCINNATI ARBOR-LOC, the newest and most favorable influence in milling. Ask for publication M-2016-1.

CINCINNATI MI Milling Machines are one of the types equipped with ARBOR-LOC spindle nose. More information on the next two pages.

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KNEE TYPE AND BED TYPE MILLING MACHINES • DIE SINKING MACHINES
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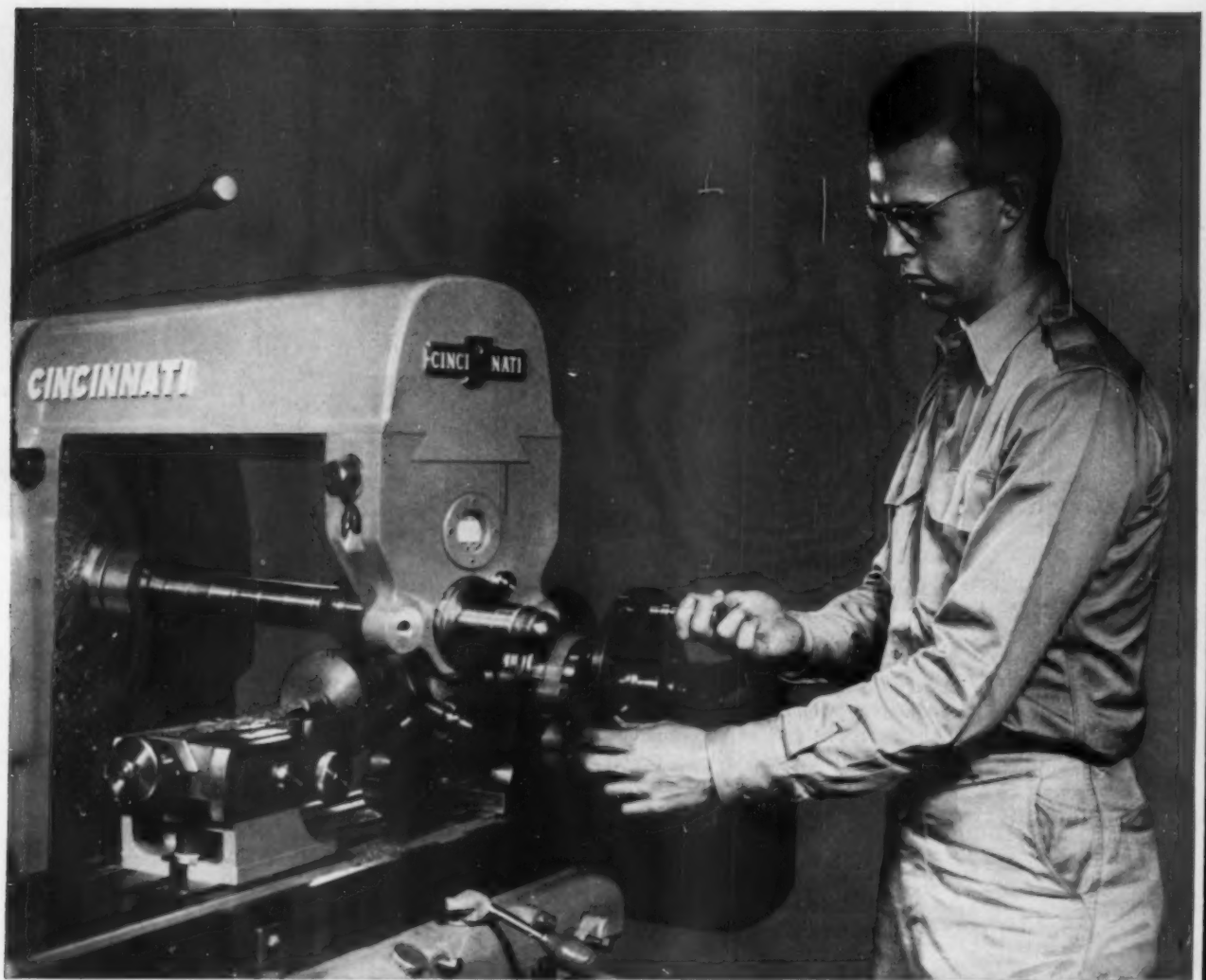
CINCINNATI®
MILLING MACHINE DIVISION

You'll benefit from these Cincinnati cost reducing Feature-Advantages

It's a revelation to see an MI Milling Machine operator change setups. Within seconds, he safely locks the arbor in the ARBOR-LOC spindle nose. Three-way rapid traverse brings the fixture and work to the cutter, quickly and without effort. Other feature-advantages, such as Dynapoise overarm, improve cutting capacity. Still others are for operator convenience; or for automatic milling; or for safety. Here are a few more which you won't want to overlook: • Independent and directional feed control levers. • Extra large micrometer dials; the quickly set, pull-out type. • All hand cranks automatically disengage in power feed. • Live rapid traverse, 150 ipm. • And for vertical machines, power feed and rapid traverse to the vertical head, including four-position turret stop.

No other medium-duty knee type milling machine combines so many toolroom advantages with the production possibilities of automatic reciprocating table cycles.



CINCINNATI DIVIDING HEAD *is a highly precise attachment for milling gear teeth and for other toolroom and production work. It is standard equipment on all ML and MI Universals.*

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THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

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and the Dependability *of the* MI LINE

Cincinnati Milling builds dependable performance into every machine bearing the Cincinnati trade-mark. This highly desirable characteristic is evident in two ways: 1) the finest construction features to ensure long productive life without interruption; and 2) the Company's unusual degree of integration. Extensive and complete foundry operations, for example, give Cincinnati precise control over every cast iron part. Gear machining and heat treating facilities are a revelation to visitors.

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	Style and Size	Spindle Drive (hp)	Table Travel
PLAIN	203-10 ML	3	28"
	205-10 MI	5	28"
	307-14 MI	7½	34"
	410-14 MI	10	42"
UNIVERSAL	203-10 ML	3	28"
	205-10 MI	5	28"
	307-14 MI	7½	34"
	410-14 MI	10	42"
VERTICAL	205-10 MI	5	28"

Catalog No. M-1995-4

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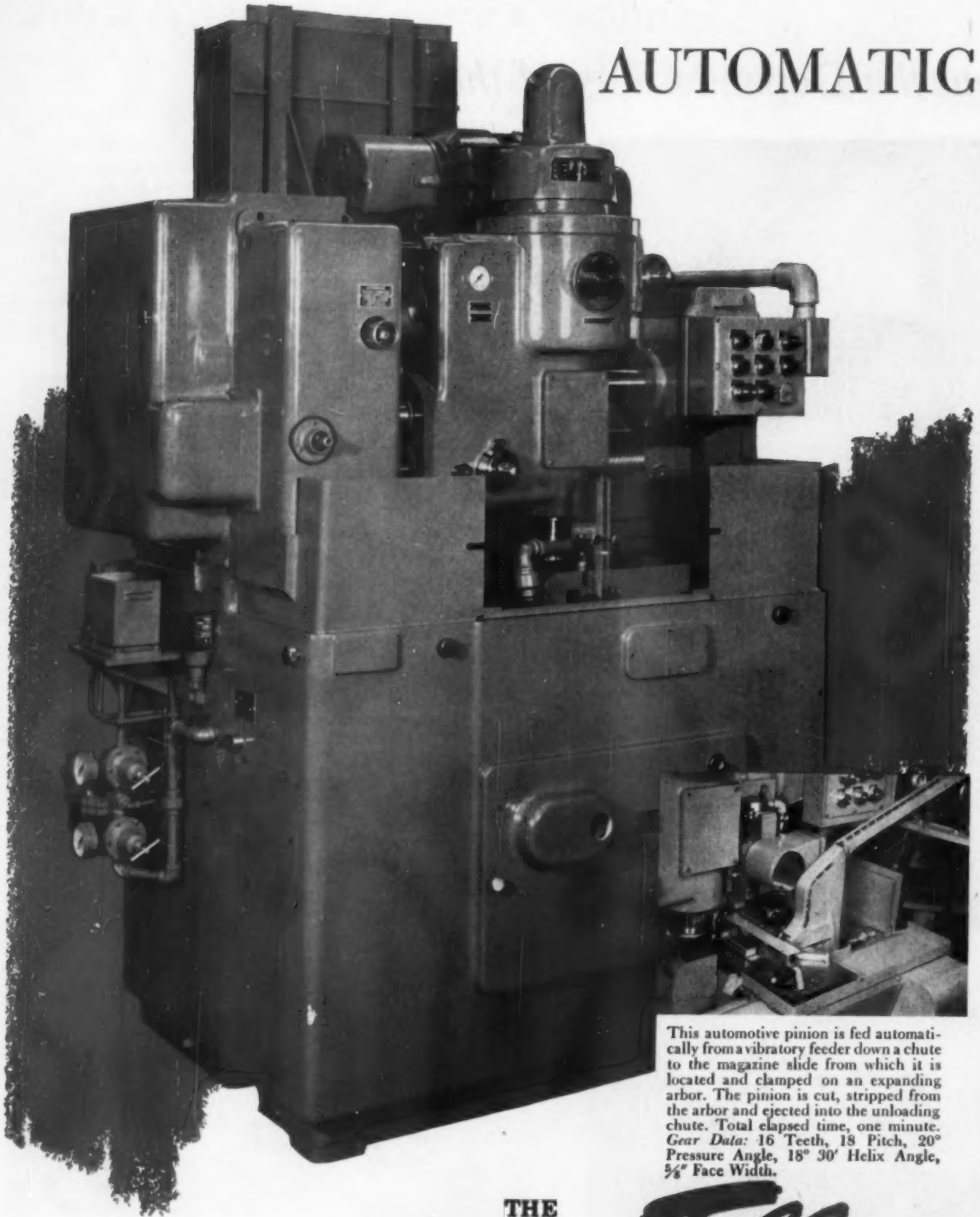


This automotive pinion is fed automatically from a vibratory feeder down a chute to the magazine slide from which it is located and clamped on an expanding arbor. The pinion is cut, stripped from the arbor and ejected into the unloading chute. Total elapsed time, one minute. *Gear Data:* 16 Teeth, 18 Pitch, 20° Pressure Angle, 18° 30′ Helix Angle, 5/8″ Face Width.

THE PRECISION LINE

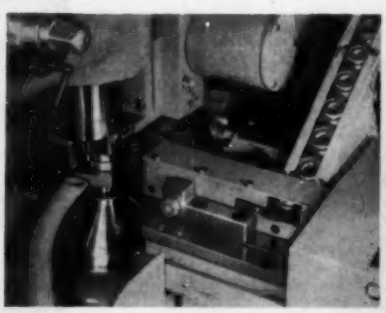
Fellows

WORK HANDLING
Is A Natural Complement to the High Production Rates of the Fellows 4GS Gear Shaper

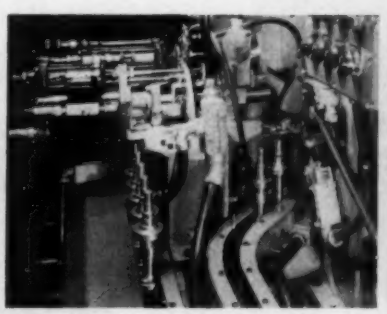
Although designed for both manual and automatic loading, the 4GS Fellows Gear Shaper makes best use of its high production rates when equipped with work handling devices.

The physical construction of the machine is such that it may be easily adapted for use with magazines and chutes for automatic loading and unloading at substantial cost savings on continuous production runs.

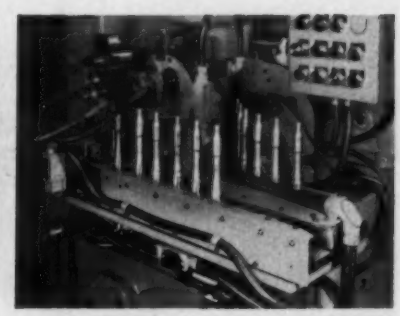
Ask your Fellows representative about the many advantages of automatic work handling with the 4GS Fellows Gear Shaper, or write direct to the Fellows Gear Shaper Company.



These internal clutch parts are handled in the same manner as the 16-tooth external pinion, except that the cutter-spindle is automatically stopped at the top of its stroke for clearance during the loading and unloading cycle. Cutting time is 1½ minutes. *Gear Data:* 10 Teeth, 12.4 Pitch (Stubbed), 30° Pressure Angle, Spur, 5/32" Face Width.



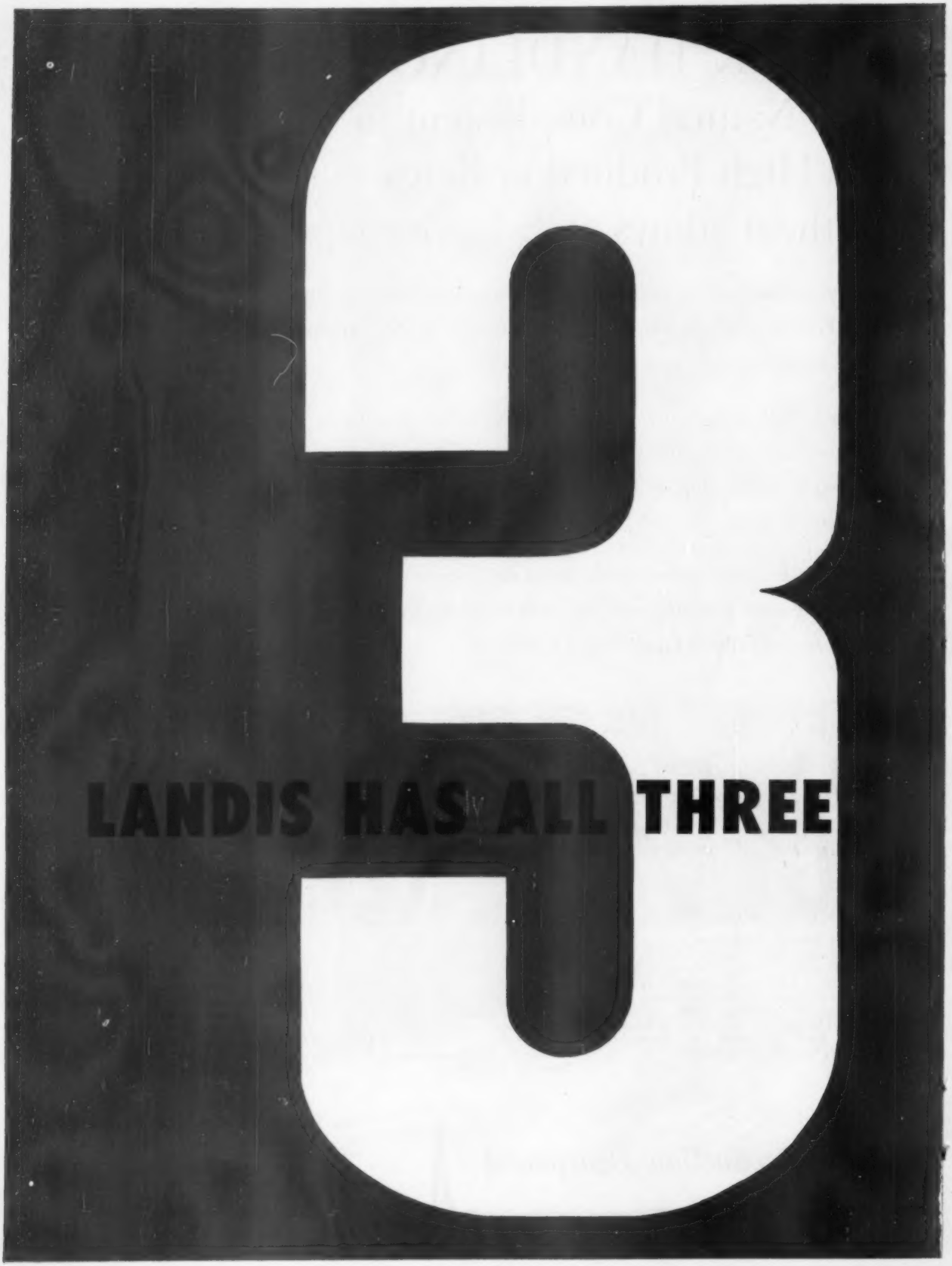
This transmission cluster gear shaft is handled by two sets of air-operated "fingers" mounted on a turret. As the turret rotates, one set of fingers moves the finished piece to the unloading chute while the other set brings the new blank into position. Cutting time is 35 seconds. *Gear Data:* 10 Teeth, 12.4 Pitch (Stubbed), 30° Pressure Angle, External Spur, 5/32" Face Width.



This automotive stem pinion is handled in the same manner as the cluster gear. In both cases, safety devices prevent the machine from starting unless the blanks are in the correct cutting position. Loading and unloading chutes may be hand or conveyor fed. Cutting time is 2½ minutes. *Gear Data:* 17 Teeth, 10 Pitch, 19° 30′ Pressure Angle, 32° 51′ Helix Angle, 5/8" Face Width.

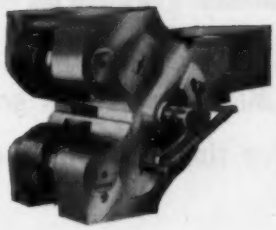
Gear Production Equipment

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont, U. S. A.
Branch Offices:
1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Ave., Los Angeles 45


3
LANDIS HAS ALL THREE

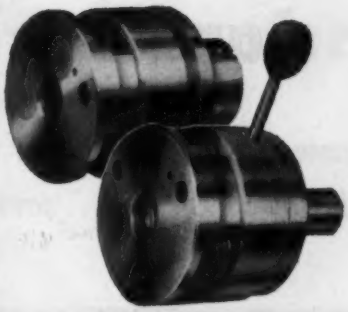
THREAD ROLLING MACHINES

. . . produce strong, accurate threads of excellent finish by the chipless, cold-forming process . . . produce left- and right-hand threads of all types (except square), including UNC, UNF, Acme, worm, and many special forms.



THREAD ROLLING ATTACHMENTS

. . . produce either straight or tapered threads . . . exclusive features include: tipping to avoid indexing interference . . . simple design allows disengaging attachment without disturbing set-up . . . and a gage determines precise position where vertical centerlines of both rolls and workpiece coincide.



THREAD ROLLING HEADS

. . . produce Class 4 threads of excellent finish at high speeds . . . feature replaceable helix angle bushings which allows rolling threads with exact helix angles without purchasing major head components.

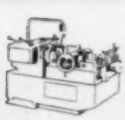
Whatever your Thread Rolling requirement, there is a LANDIS machine or tool to do the job. Our detailed knowledge of the most efficient application of the different methods of thread rolling—and our more than 50 years experience in the threading field—has resulted in our producing a complete line of thread rolling equipment. Make LANDIS your one-stop source for all your thread rolling needs. When inquiring about Thread Rolling, describe your operation and send specifications.

LANDIS *Machine* COMPANY / WAYNESBORO PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

MMT·PE BOOTH NO. 432

S50C



Threading Machines

Die Heads—Rotary & Stationary

Taps—Collapsible & Solid Adjustable

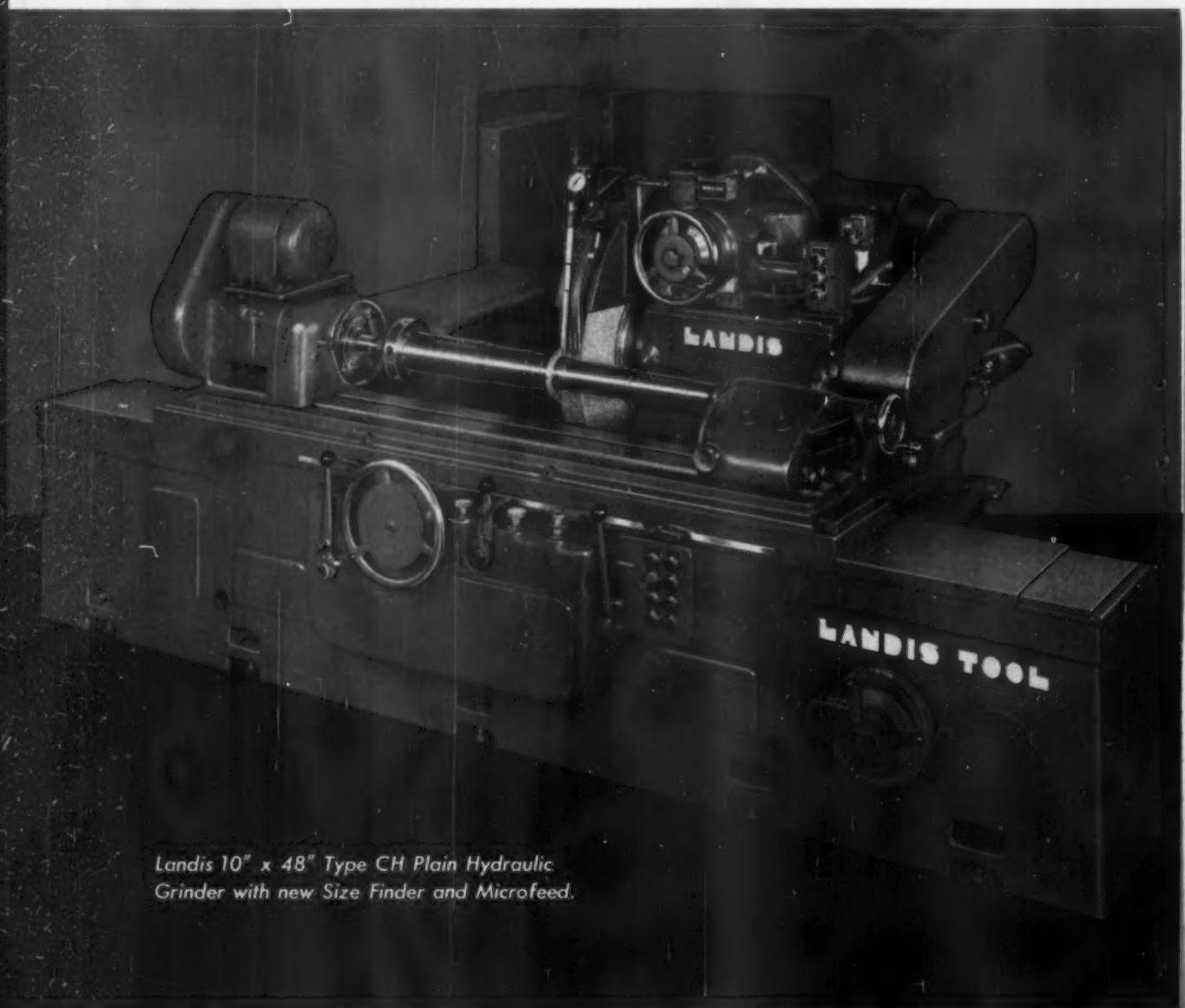
Centerless Thread Grinding Machines

Thread Rolling Tools

Thread Rolling Machines

Landis grinder with new Size Finder

new Landis development with Microfeed lowers grinding costs on lathe headstock spindle... saves setup time... assures close tolerances



Landis 10" x 48" Type CH Plain Hydraulic Grinder with new Size Finder and Microfeed.

MMT PE

LANDIS TOOL COMPANY

saves 82 minutes grinding 9 diameters

production data

Part:.....Lathe headstock spindle

Machine:.....Landis 10" x 48"
Plain Grinder with Size Finder
and Microfeed

Operation:.....Grinding 9 different diameters.
One diameter is tapered

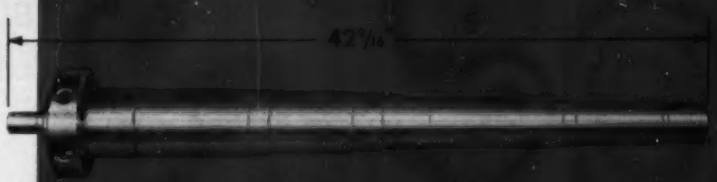
Production:.....With new Landis Size Finder—
1 part every 42 minutes

Former method—1 part completed in
124 minutes

Stock removal:..020"-.030"

Part tolerances: Size—.0005" max.
Roundness—.00005" max.
Straightness—.0001"

Finish:.....25 RMS



size finder

How size finder speeds multiple diameter shaft grinding

The new Landis Size Finder is a direct reading indicator on the wheel feed handwheel. It permits the operator to set the finish dimension on the indicator by turning the wheel feed handwheel. This establishes the face of the wheel to the correct position to grind the desired dimension. Operator starts the cycle, applies the sizing gage and stops the cycle when the gage shows finish size. He moves the work table, resets the Size Finder for the next diameter and repeats the cycle.

Size Finder with Microfeed shows remarkable savings in setup and grinding time. Send us prints of your shaft for our proposal.

WAYNESBORO, PENNSYLVANIA

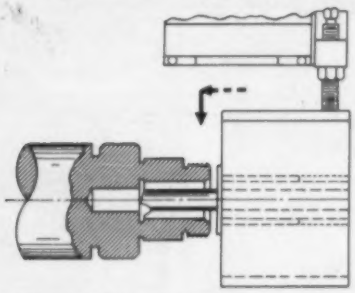
LANDIS

precision grinders

Warner & Swasey has, in its 3" Capacity Single Spindle Bar Automatic, a machine with the power and flexibility to handle long, short and medium run bar jobs...simple or complex... precision runs or blanking jobs —equally well!

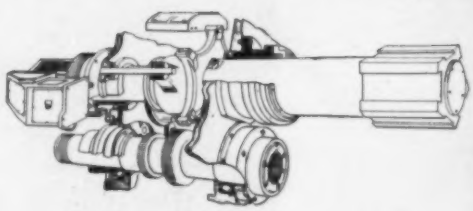
NEW IDEA IN BAR AUTOMATICS

PRODUCTION AND ACCURACY ASSURED BY:



Unique Tool Slide Action permits handling internal recesses and grooves with standard tools on a wide variety of jobs.

End-working turning heads let you multiple-tool with a wide selection of standard tools. Hydraulic chucking unit available as an optional.



Single housing for turret and spindle bearings ends spindle rise due to different temperatures. Close tolerances are held from start-up to shut-down.

Stays accurate! Rugged, self-contained design needs no periodic leveling.

Independently operated cutoff slide permits virtually free cutoff cycle since it may be started with any one of the turret strokes.

Quick, camless setup. No cams to change, store or design. All automatic functions are set and controlled by easily installed pins or trip blocks.

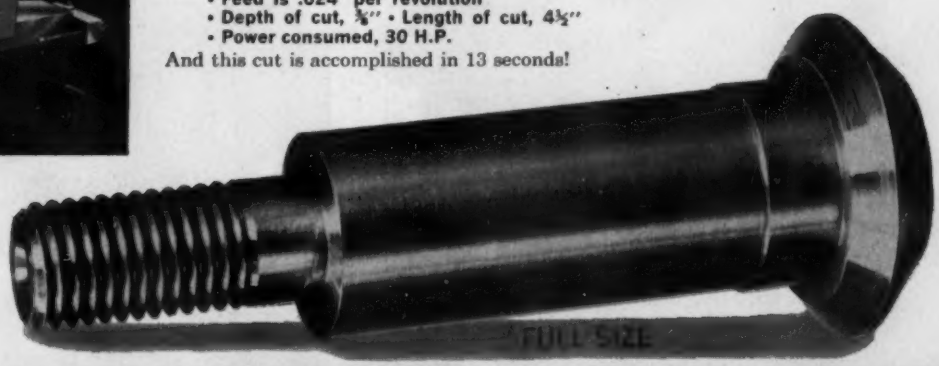
You can produce it better, faster, for less with a

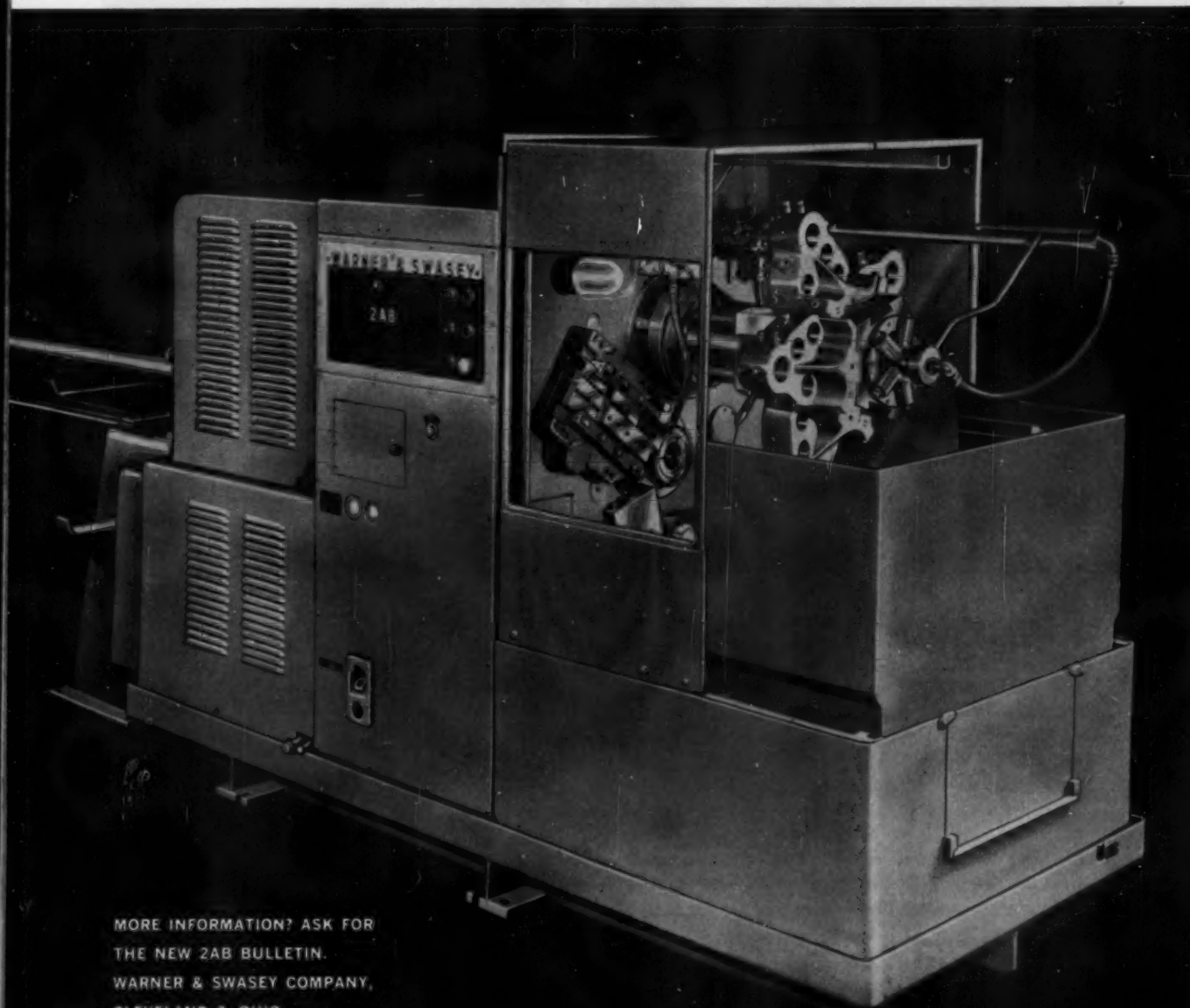
WARNER & SWASEY

FOR DEEP CUTS WITH A HEAVY FEED. The 2AB with its exclusive Single Cutter Turner is the only bar automatic that can hog metal like this. The part shown is machined from 2" C-1141 annealed bar stock. The 1¼" diameter is held to a .001 tolerance and 25 micro inch finish in one cut!

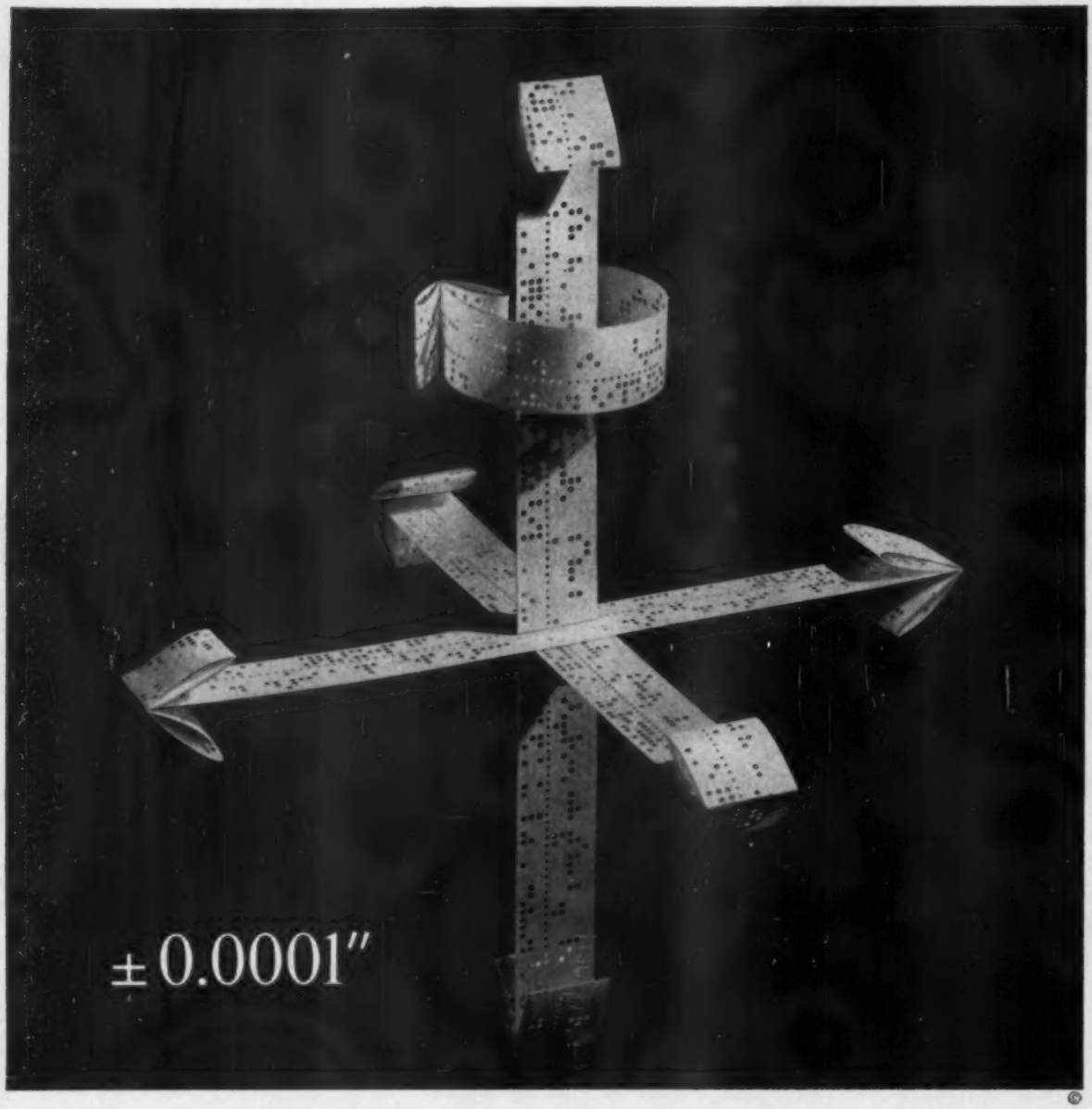
- **Speed is 908 r.p.m. or 476 s.f.m.**
- **Feed is .024" per revolution**
- **Depth of cut, ⅜" • Length of cut, 4½"**
- **Power consumed, 30 H.P.**

And this cut is accomplished in 13 seconds!





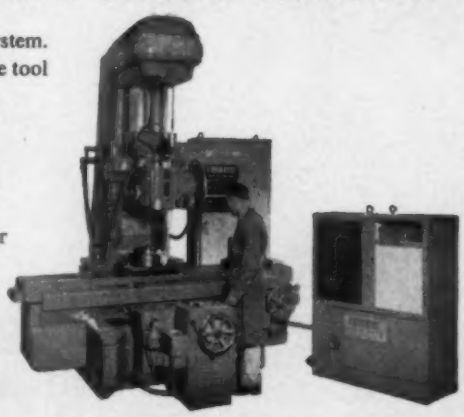
MORE INFORMATION? ASK FOR
THE NEW 2AB BULLETIN.
WARNER & SWASEY COMPANY,
CLEVELAND 3, OHIO



PRECISION BORING: Control gains a Third Dimension!

Now Fosdick adds Numerical Depth Control to its unique positioning system. Another loophole for error in precision boring has disappeared. Watch the tool drive smoothly to depth, boring a hole with finer finish, precise in depth and location. Watch the tool advance and retract quickly, saving time. *Tape or dial any depth. Absolutely no stops to preset.*

See how this control signals every tool change and compensates for tools of random length. It was planned when the Fosmatic precision boring machines were designed, so that it fits and takes no extra space. Consider what this new dimension in control means to your critical production jobs. Write for catalog PB-W.



FOSDICK THE FOSDICK MACHINE TOOL COMPANY
Cincinnati 23, Ohio

◄ CIRCLE 164 READER SERVICE CARD

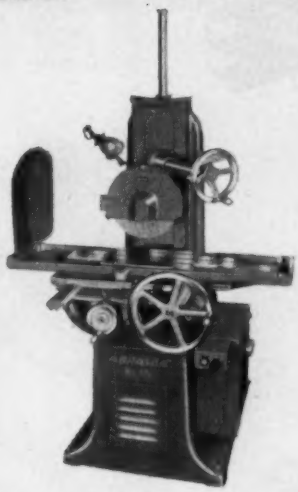
CIRCLE 165 READER SERVICE CARD

the ABRASIVE line

of precision surface grinders
first for accuracy...first for value

HYDRABRASIVE

The modern line of hydraulically operated surface grinders for general machine shops, production operations and tool shops. Four sizes with 12" wheel and 3 hp motor.

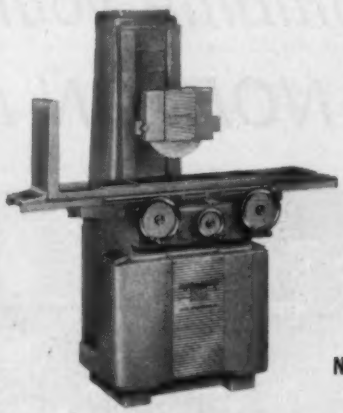


No. 1½

This is probably the most popular machine for tool and die work. Hand operated with a 12" wheel for deep slot grinding, 1 hp motor and 10" x 15" x 12" size.

No. M3 and 3B

For production and toolroom jobs where a fast, accurate surface grinder is needed with power table traverse and cross feed. M3 has 2 hp motorized spindle. 3B has 3 hp main drive with belt to spindle. Both 8" x 24" x 12" capacity with 10" wheel.

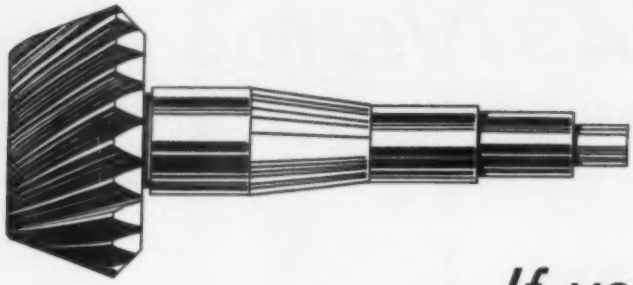


No. 618

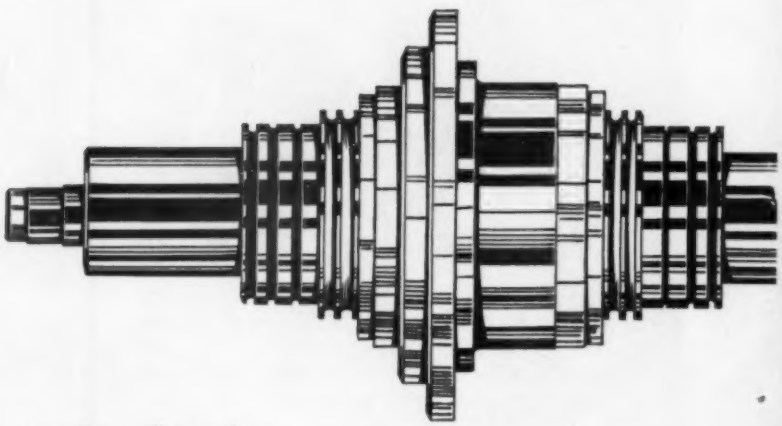
One of the newest and most modern machines of its size for easy hand operation and dependable precision results. It's available with either a 7" wheel and 1 hp motor, or a 12" wheel with 2 hp motor.

ABRASIVE
precision surface grinders

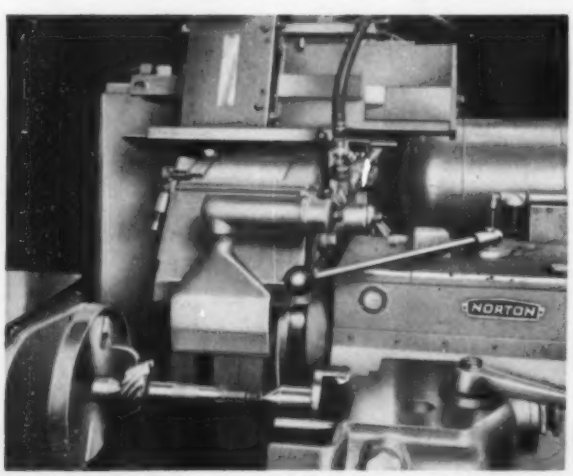
a product of
LANDIS TOOL
world's largest manufacturer of precision grinding machinery
WAYNESBORO, PENNSYLVANIA



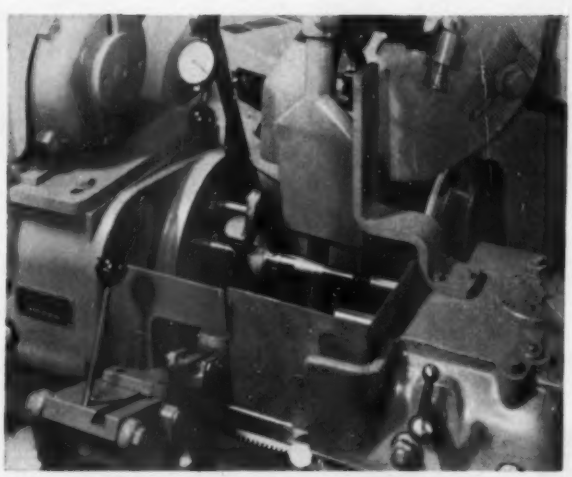
If you grind parts



combine your grinds in NORTON machines...like these



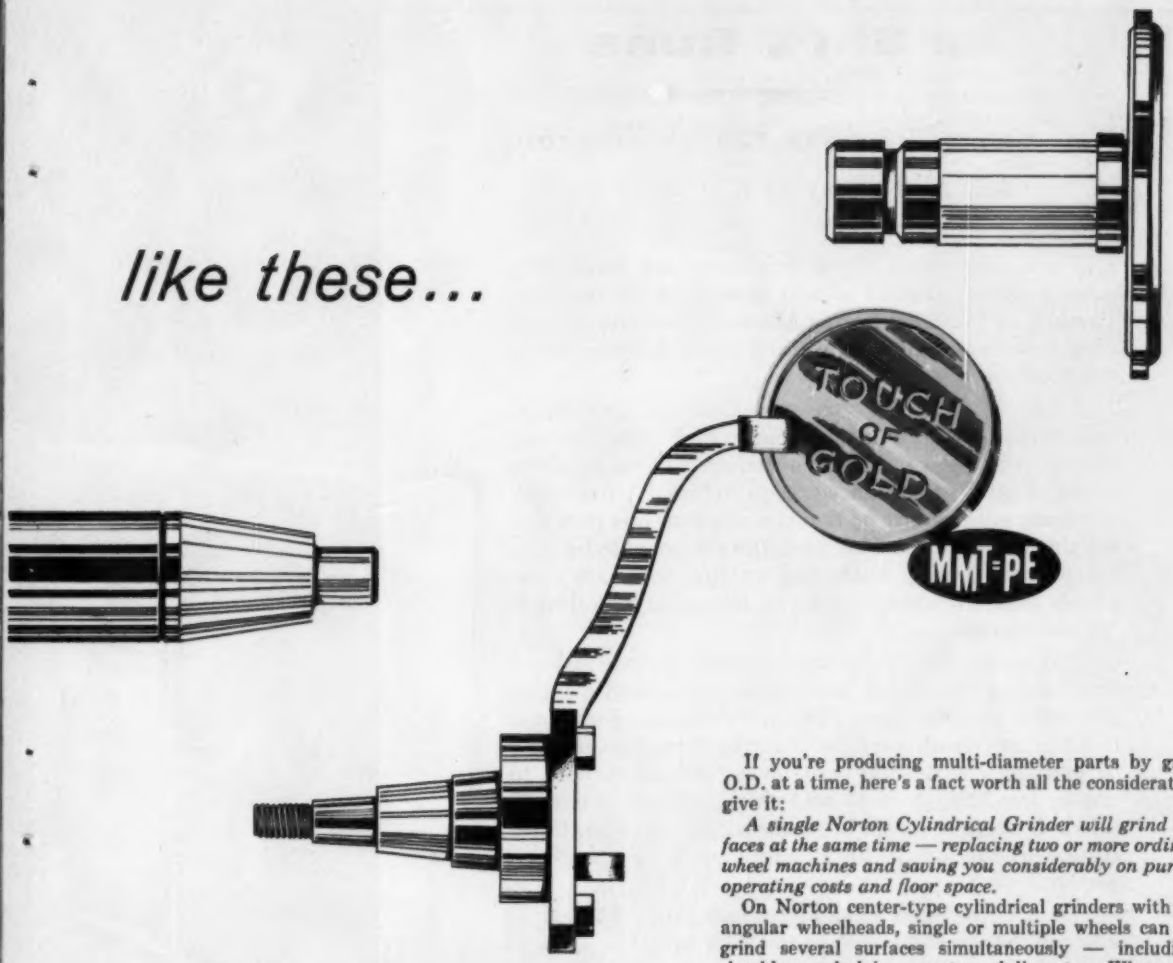
Grinding three stem pinion diameters on a Norton Type CTU Cylindrical Grinder. This multiwheel setup grinds three diameters in a single plunge cut, eliminating the need for separate operations. Norton automatic truing substantially increases the efficiency of multiwheel grinding.



Grinding a steering knuckle on a Norton Type CV-4 Angular Wheelslide Grinder with a dual wheel setup. Norton machines of this type offer unlimited opportunities to save time and effort when grinding several diameters, adjacent radii, and shoulders.

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — **BEAR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

like these...



If you're producing multi-diameter parts by grinding one O.D. at a time, here's a fact worth all the consideration you can give it:

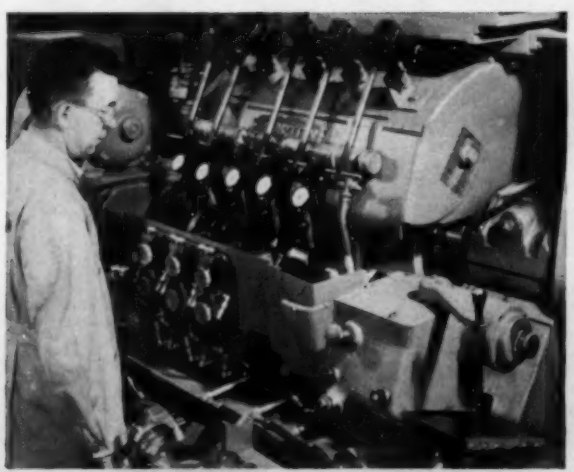
A single Norton Cylindrical Grinder will grind several surfaces at the same time — replacing two or more ordinary single-wheel machines and saving you considerably on purchase costs, operating costs and floor space.

On Norton center-type cylindrical grinders with straight or angular wheelheads, single or multiple wheels can be used to grind several surfaces simultaneously — including tapers, shoulders and plain or contoured diameters. Where wider wheel spacing is required, the heavy duty Type CM-1 Multiwheel Grinder can be used to good advantage for high speed, high production O.D. grinding.

Among the many time-and-money-saving features engineered by Norton for these machines, push-button actuated automatic wheel truing is one of the most outstanding advancements. This device provides close, uniform control of the amount of wheel face removed by the truing diamond, and trues the wheel or wheels either straight or formed, with speed and precision.

Get further facts on how Norton cylindrical grinders are bringing new efficiency and economy to O.D. grinding throughout industry. Your Norton Man, a trained grinding engineer, will be glad to show how these multi-grind, multi-wheel machines can benefit your own production. NORTON COMPANY, Machine Division, Worcester 6, Mass.

District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.



Grinding multiple diameters on a crankshaft, this Norton Type CM-1 Multiwheel Grinder finishes the job in about the same time it would take a conventional machine to grind just one of these diameters. The massive wheel spindle holds a number of 36" wheels, properly spaced, within a wide span of 30".

NORTON

MACHINE TOOLS

75 years of . . . Making better products
. . . to make your products better

MACHINE TOOL DIVISION: Grinding and Lapping Machines — **G & E DIVISION:** Shapers • Gear Cutting Machines • Gear Induction Hardeners

Precision and Versatility for Short Runs

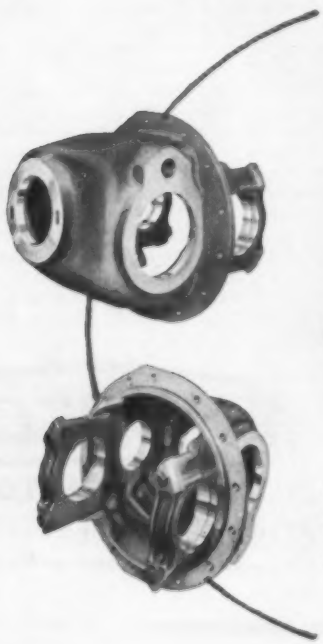
New Cross Precision Boring Machine for Differential Carriers

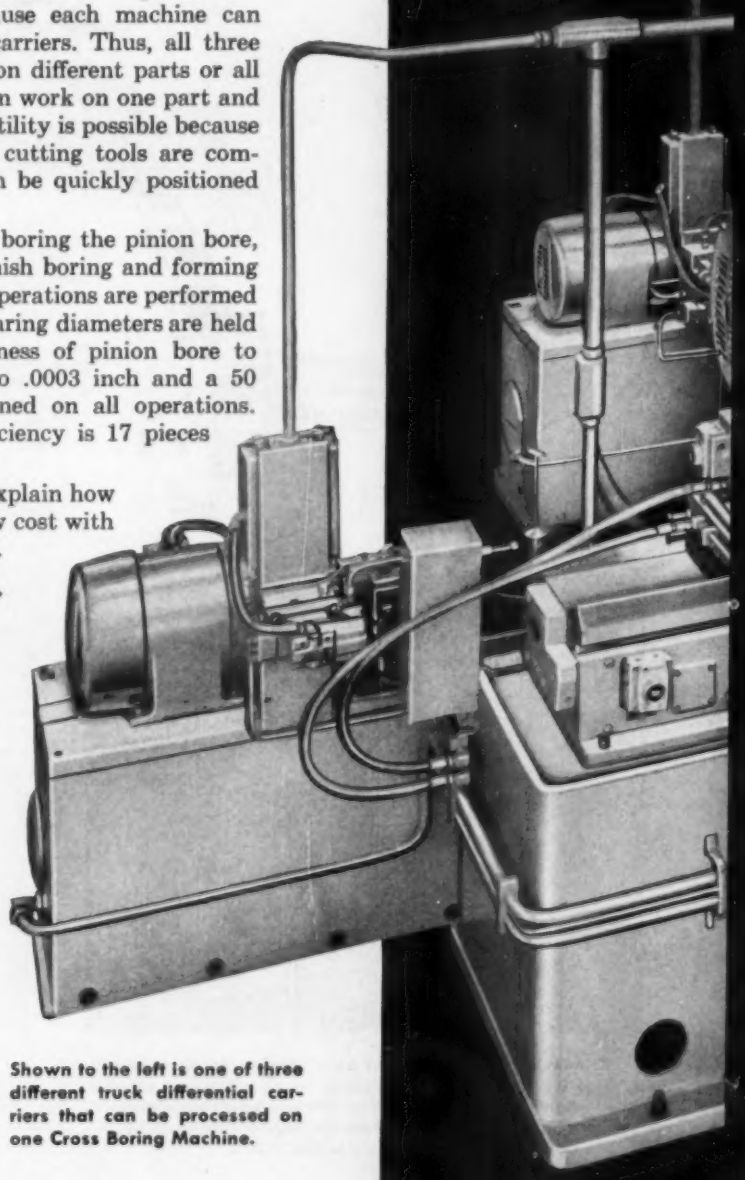
The versatility that Cross engineers can build into automation equipment is well illustrated by this new Three-Way Precision Boring Machine. It is one of three similar units designed to process three different truck differential carriers.

Unusual flexibility for variations in production requirements is provided because each machine can process any one of the three carriers. Thus, all three pieces of equipment can work on different parts or all can work on one part or two can work on one part and the third on another. This versatility is possible because the fixtures, boring heads and cutting tools are completely interchangeable and can be quickly positioned for each carrier.

Processing consists of finish boring the pinion bore, finish facing the pinion boss, finish boring and forming grooves in the cross bores. The operations are performed to a high degree of precision. Bearing diameters are held to less than .001 inch, squareness of pinion bore to pinion mounting face is held to .0003 inch and a 50 micro inch rms finish is obtained on all operations. Rated production at 100% efficiency is 17 pieces per hour.

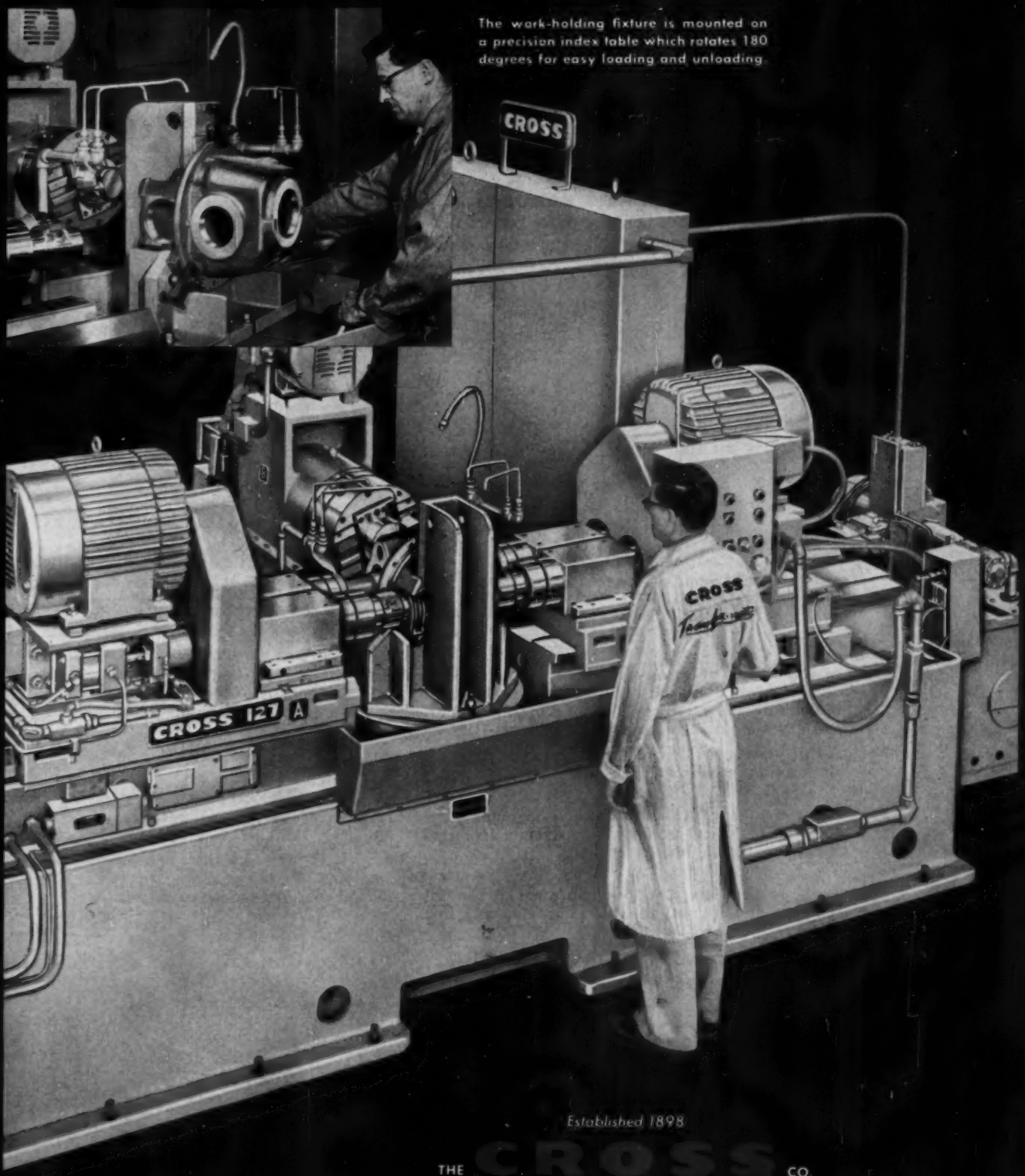
Let a Cross Sales Engineer explain how you can do precision work at low cost with versatile automation equipment.





Shown to the left is one of three different truck differential carriers that can be processed on one Cross Boring Machine.

Another Automation First by Cross



The work-holding fixture is mounted on a precision index table which rotates 180 degrees for easy loading and unloading.

Established 1898

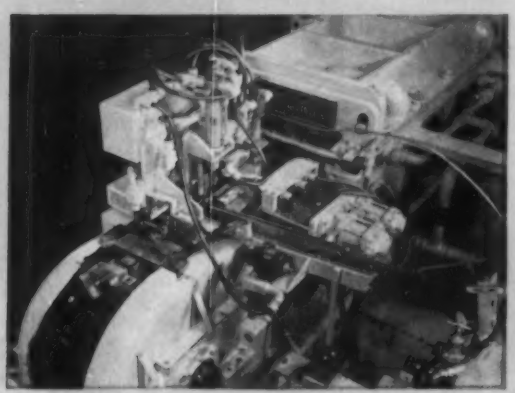
THE CROSS CO.

First in Automation

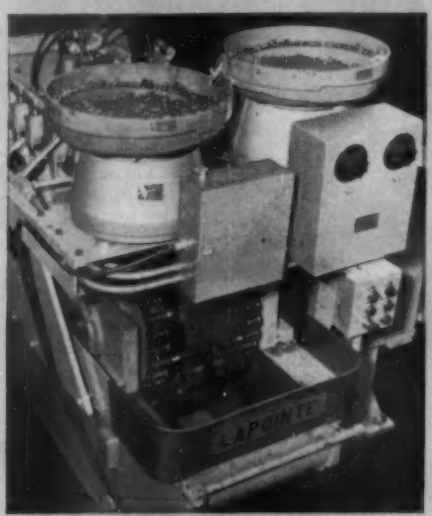
PARK GROVE STATION • DETROIT 5, MICHIGAN

These pictures tell the story of PRECISION on the LAPOINTE CONTINUOUS-

AUTOMATIC LOADING equipment can be used to feed parts into the machine, in many applications.



Computer relays are broached with speed and accuracy on this automatically-loaded Lapointe Continuous-Broaching Machine, 10-ton, 60-inch stroke.



Production rates up to 3200 parts per hour are maintained day in and day out on this hopper-fed Lapointe Continuous-Broaching Machine, 10-ton, 42-inch stroke.

In important plants everywhere, Lapointe Continuous-Broaching is eliminating production bottlenecks and driving down manufacturing costs. Small parts are broached for business machines, cameras, computers . . . larger, heavier parts are broached for automotive and other industrial applications.

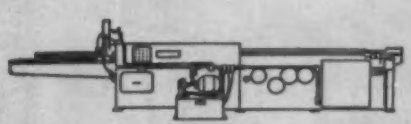
All the guesswork's gone, when you surface-broach your repetitive contours and flats on the Lapointe Continuous-Broaching Machine.

You *know* you will get

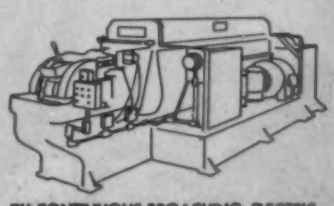
- tremendous production, even on tough forged blanks
- dimensional accuracy to exacting tolerances
- remarkable surface finish
- low unit cost

Perhaps Lapointe Continuous-Broaching can solve one of your production problems. You can find out very easily, by dropping us a line!

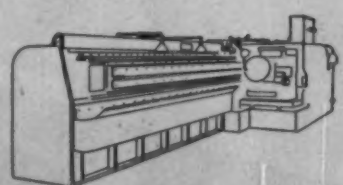
Lapointe-built Broaching Machines are available in hydraulic and electro-mechanical drives.



60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC

◄ CIRCLE 170 READER SERVICE CARD

CIRCLE 171 READER SERVICE CARD

MMT PE

MASS PRODUCTION BROACHING MACHINE

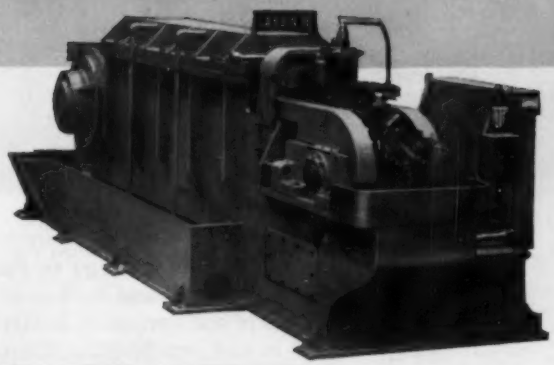
MANUAL LOADING
is fast and easy,
for parts such as these.

This is the machine that doesn't stop! Ruggedly built, and with powerful, heavy-duty twin drive chains, this Lapointe Continuous Broaching Machine comes in five standard sizes: 10 to 60 HP, 40 to 160-inch stroke. Any desired combination of horsepower and stroke can be obtained.

All fixtures are designed with automatic clamping and provide self-ejecting of parts.

Easy loading eliminates strain, prevents operator fatigue.

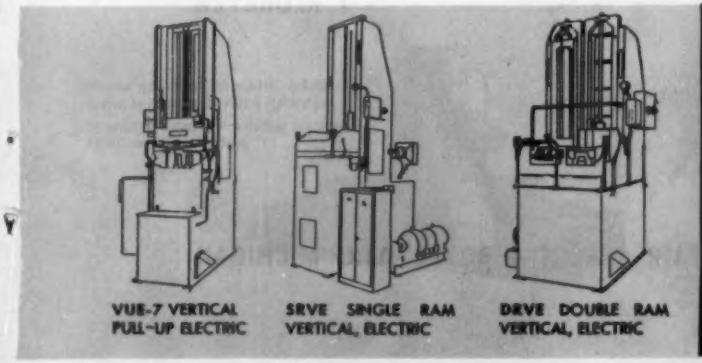
Carbide tooling can be used wherever required.



THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



VUE-7 VERTICAL PULL-UP ELECTRIC

SRVE SINGLE RAM VERTICAL, ELECTRIC

DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING

T. R. DREYER, Vice President—Brooklyn Manufacturing
American Machine & Foundry Company

a man who came to Fair Street

"The JIGMIL Technique enabled us to establish new manufacturing methods which provided greater accuracy, improvement in our product, substantial reductions in assembly time, and major reductions in machine time, all without investment in jigs."

"We accepted an invitation to go to Fair Street and there saw the JIGMIL Technique in operation doing boring and milling to high degrees of accuracy and economy. The potential savings in our own plant became apparent and we developed a JIGMIL program which resulted in new economies in our manufacturing methods. The inherent accuracy, power and rigidity of this machine tool, combined with its automatic positioning and ease of operation are especially adaptable to precision boring and milling operations on side frames and gear boxes. In addition to the noteworthy savings in boring time and reduced tooling cost, we gained the advantage of milling in the same setting at a minimum of cost."

T. R. DREYER

DE VLIEG MACHINE COMPANY, FAIR STREET • ROYAL OAK, MICHIGAN

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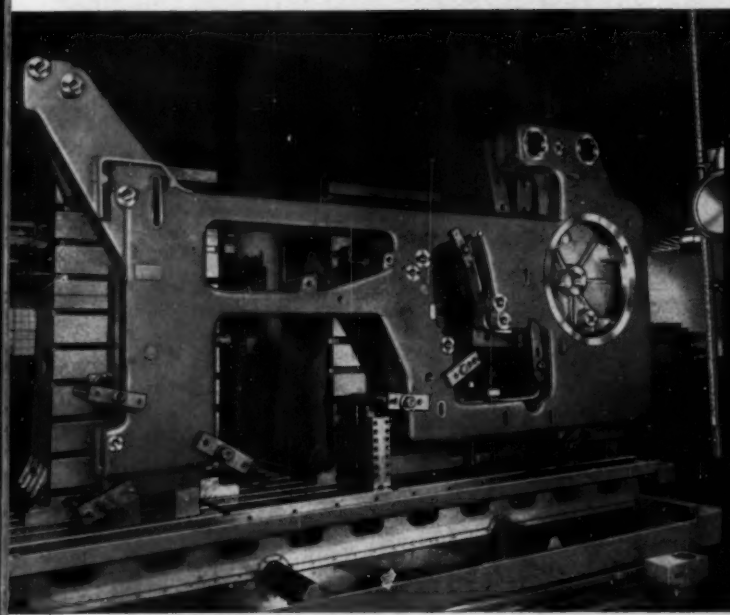
SOME OF OUR JIGMIL USERS

Aerojet-General Corp.
American Can Co.
Avco Manufacturing Corp.
Baldwin-Lima-Hamilton Corp.
Beech Aircraft Corp.
Boeing Airplane Co.
Boyar-Schultz Corp.
Carrier Corp.
Clark Equipment Co.
Continental Can Co., Inc.
Convair, A Division of General Dynamics Corp.
Crankshaft Machine Co.
The DeLaval Separator Co.
Detroit Broach Co.
Douglas Aircraft Co., Inc.
Eastman Kodak Co.
Emsco Manufacturing Co.
The Falk Corp.
Foote-Burt Co.
Goss Printing Press Co.
Grumann Aircraft Engineering Corp.
Hamilton Ltd., Division, United Aircraft Corp.
Hardinge Bros., Inc.
The Heil Co.
Illinois Tool Works
Ingersoll-Rand Co.
LeTourneau-Westinghouse Co.

MMT-PE — MODERN MACHINE TOOLS — PRODUCTION EFFICIENCY



A FEW PROVEN ADVANTAGES OF THE JIGMIL TECHNIQUE—

- Eliminates cost of expensive jigs and production delays resulting from their manufacture.
- Simplifies tooling.
- Employs automatic functions to reduce factors of human error even in close tolerance work.
- Makes possible greater flexibility of product design.
- Improves end product by permitting interchangeable assembly of parts without hand fitting.
- Increases production and product accuracy.

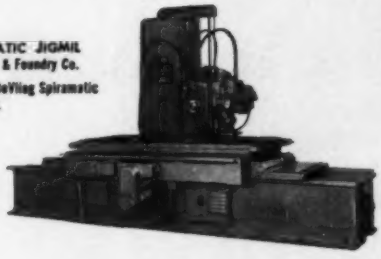
ACCURACY IS AN ECONOMY!

A TYPICAL EXAMPLE OF JIGMIL VERSATILITY

AMF uses the JIGMIL Technique for machining a multitude of components for their cigarette making machines, bread-wrapping machines, automatic pin setters, cigar making machines and many others. Illustrated is a pair of bread-wrapper side frames set against angle blocks on a Model 4B-96 SPIRAMATIC JIGMIL. All boring and side milling operations were done on the JIGMIL in one setup. Previous time on conventional boring and milling machines was 10 hours per part. Time on the JIGMIL is 3 hours per part.

The Glenn L. Martin Co.
Michigan Tool Co.
North American Aviation, Inc.
Northrop Aircraft, Inc.
Otis Elevator Co.
Pratt & Whitney Aircraft Division, United Aircraft Corp.
Solar Aircraft Co.
Speco Division, Kelsey-Hayes Co.
Thompson Products, Inc.
United Shoe Machinery Corp.
Western Electric Co., Inc.
Yale and Towne Manufacturing Co.
York Corp.

WILL YOU BE THE NEXT TO VISIT FAIR STREET,



Model 4B-96 SPIRAMATIC JIGMIL as used by American Machine & Foundry Co.

For complete information on DeVlieg Spiramatic Jigmils, send for new catalog.

DeVlieg

SPIRAMATIC JIGMILS®

ACCURATE HOLES AND FLAT SURFACES IN PRECISE LOCATIONS

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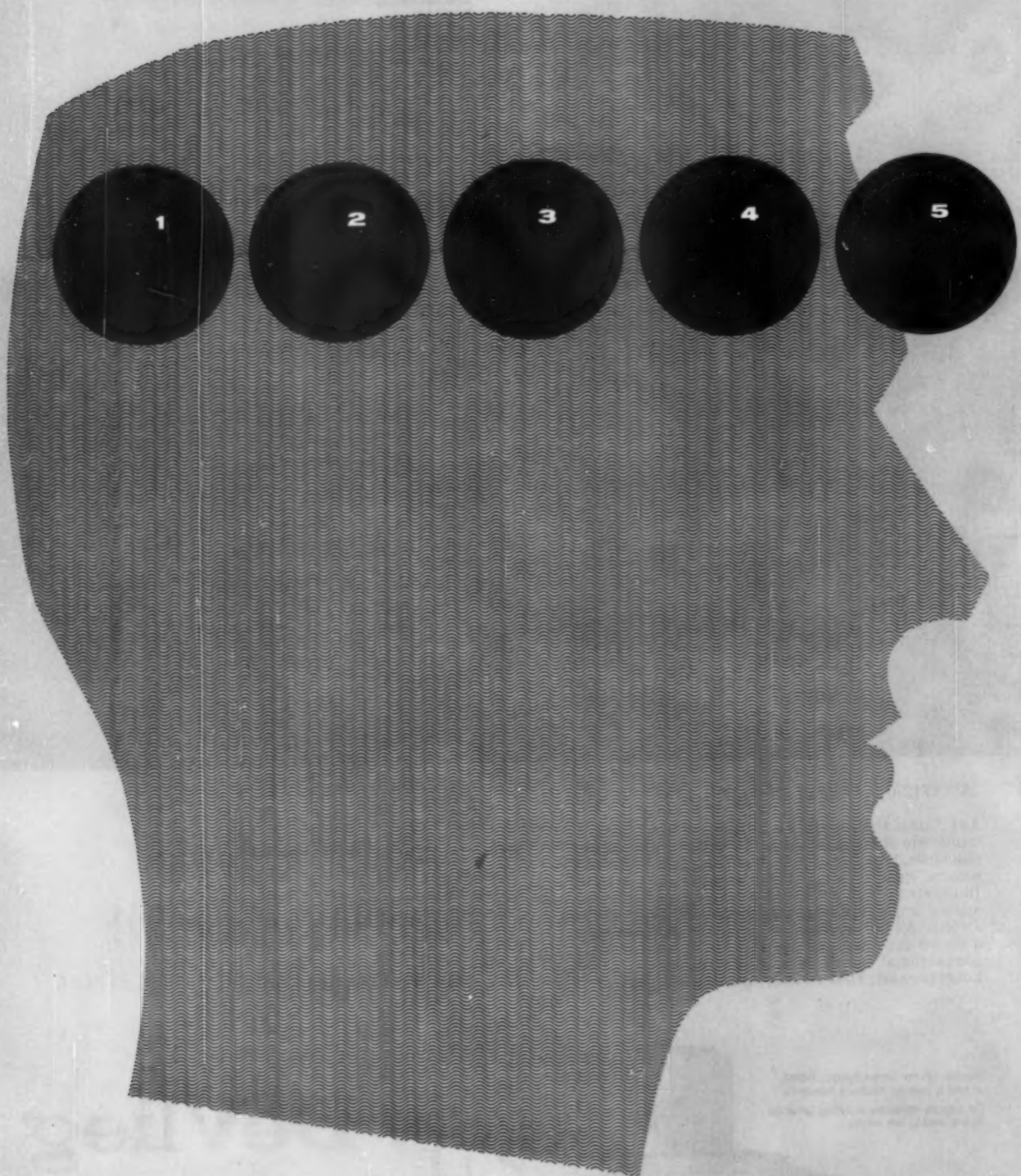

1
2
3
4
5

count to ten . . .

and then

scream

That shipment of high temperature alloys hits your receiving dock. Everything goes great. No production headaches. No kicks from the field. Your wife looks several years younger and the dog doesn't growl at you any more.

You reorder from the same company. Still no problems . . . except you can't stop smiling while you shave. All told, you get nine separate shipments from this source. You're beginning to think high temperature alloy problems are the fantasies of fools.

So you place order number ten. Same supplier. Same grade. Same everything . . . except *this* lot fails to get by the eagle eye of your inspector. You've got a real procurement problem. Schedules suffer. Now your wife looks twenty years older and the dog snaps at your heels and you would trade your favorite putter for a high temperature alloy you can count on.

Carpenter hasn't come up with a cure for all your woes, but we have perfected a revolutionary new steelmaking process which minimizes variations from lot to lot. Called the MEL-TROL® process, it features a patented mold which reduces segregation of harmful impurities during solidification of the ingot. Result: you get clean, sound, tough metal from surface to centerline . . . in every bar . . . every time you order.

Now predictable performance is yours for the asking.

tool and die steels
stainless steels
electronic, magnetic and electrical alloys
high temperature alloys
special-purpose steels
tubing and pipe
fine wire specialties

Carpenter steel

a new company 70 years old

The Carpenter Steel Company, Main Office and Mills, Reading, Pa.
Alloy Tube Division, Union, N. J.
Webb Wire Division, New Brunswick, N. J.
Carpenter Steel of New England, Inc., Bridgeport, Conn.

◄ CIRCLE 175 READER SERVICE CARD

CIRCLE 176 READER SERVICE CARD

PRECISION:

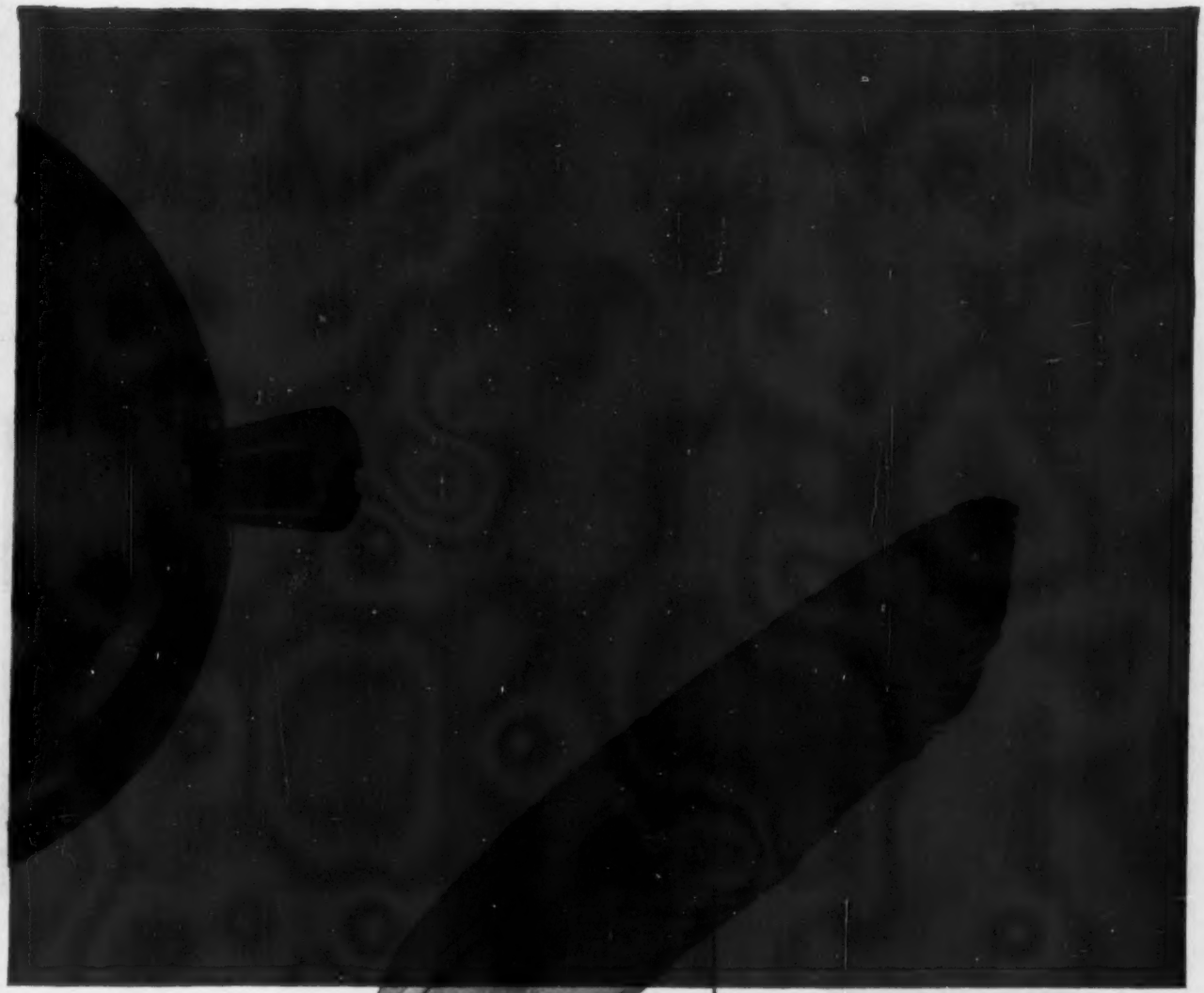
Reason enough

Beryllium specialists, Leemath Incorporated of Long Island, create delicate and precise mechanisms in this high strength but toxic and abrasive wonder metal. In their temperature-controlled shop, this feather-light gyro float assembly (shown actual size, right) was turned on a special high-precision LeBlond Dual-Drive Lathe. *Spherocity had to be concentric with the two major axes within .0005" total indicated runout of 1.8750"!* (In order to hold the assembly that close, component tolerances had to be even tighter!)

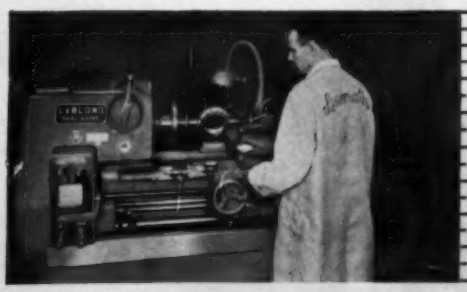
To perform such touchy work, Leemath ordered their LeBlond 15" Dual-Drive to ultra-high precision standards. For this lathe Timken furnished specially-made bearings with one-third the runout of their finest precision class. With it came the standard features that give LeBlond its reputation for long-lived precision—combination gear-belt drive headstock with 16 speeds, 31 to 2400 rpm; compensating vee bed way construction with hardened steel shears; thrust-lock tailstock; and many more.

People buy lathes for many reasons. But when, like Leemath, they must have precision they can depend upon, that is reason enough to buy LeBlond.

If you would like to have the full story of LeBlond's Dual-Drive, ask your distributor or write for Bulletin 6A.



to buy LeBlond



LeBLOND of Cincinnati

THE R. K. LeBLOND MACHINE TOOL COMPANY
Cincinnati 8, Ohio

For every foundry—best news in years!

Norton Resinoid Wheels

Norton Foundry News

NORTON

BETTER SNAGGING WHEELS!

B11 resinoid bond gives wheels more uniform structure and better balance, assuring faster, cooler grinding, plus smoother operation. B11 wheels are available in sizes, types and half-grade increments of hardness for all jobs — on your swing frame grinders and floor stands down to the smallest portables.

BN and BNA straight wheels, reinforced with glass cloth, are strong and safe, excellent for cutting and notching gates and risers. Made in thinnesses down to 1/16" and 3/32".

BD and BDA wheels, raised hub type, glass-nylon reinforced, are ideal for a wide job range — smoothing casting surfaces, cleaning between teeth of large gear castings, many slotting and cutting operations.

Better Quality Control!

Now Better Than Ever

Newest modern plant — designed and equipped to improve the wheels foundries need most — now going strong!

Plant No. 8, the newest Norton building in Worcester, is a good deal more than another regular step in the steady expansion of Norton manufacturing space.

This ultra-modern, multi-million dollar plant was built specifically to improve the manufacture and performance of resinoid wheels — the wheels foundries need most and use most.

Working equipment is up-to-the-minute in every detail. In-line production, now in full swing runs as smoothly and accurately as clockwork. Quality control, always a key factor in Norton leadership, is now as thorough as latest processing development can make it. New Plant No. 8 and its new resinoid wheels are the latest proof of how Norton maintains "Touch of Gold" performance at highest efficiency.

The better the processing, the better the performance. That's why every Norton resinoid wheel removes more metal per dollar throughout longer service life.

Small Cup Wheels . . . Lots of Safety

Built-in reinforcement is available in Norton cup wheels of standard size 6/4 3/4 x 2". The new steel cup bushing, molded firmly into the wheel back, does not replace a wheelguard but does provide additional safety — another valuable feature of Norton portable wheels that do more work with less operator-fatigue.

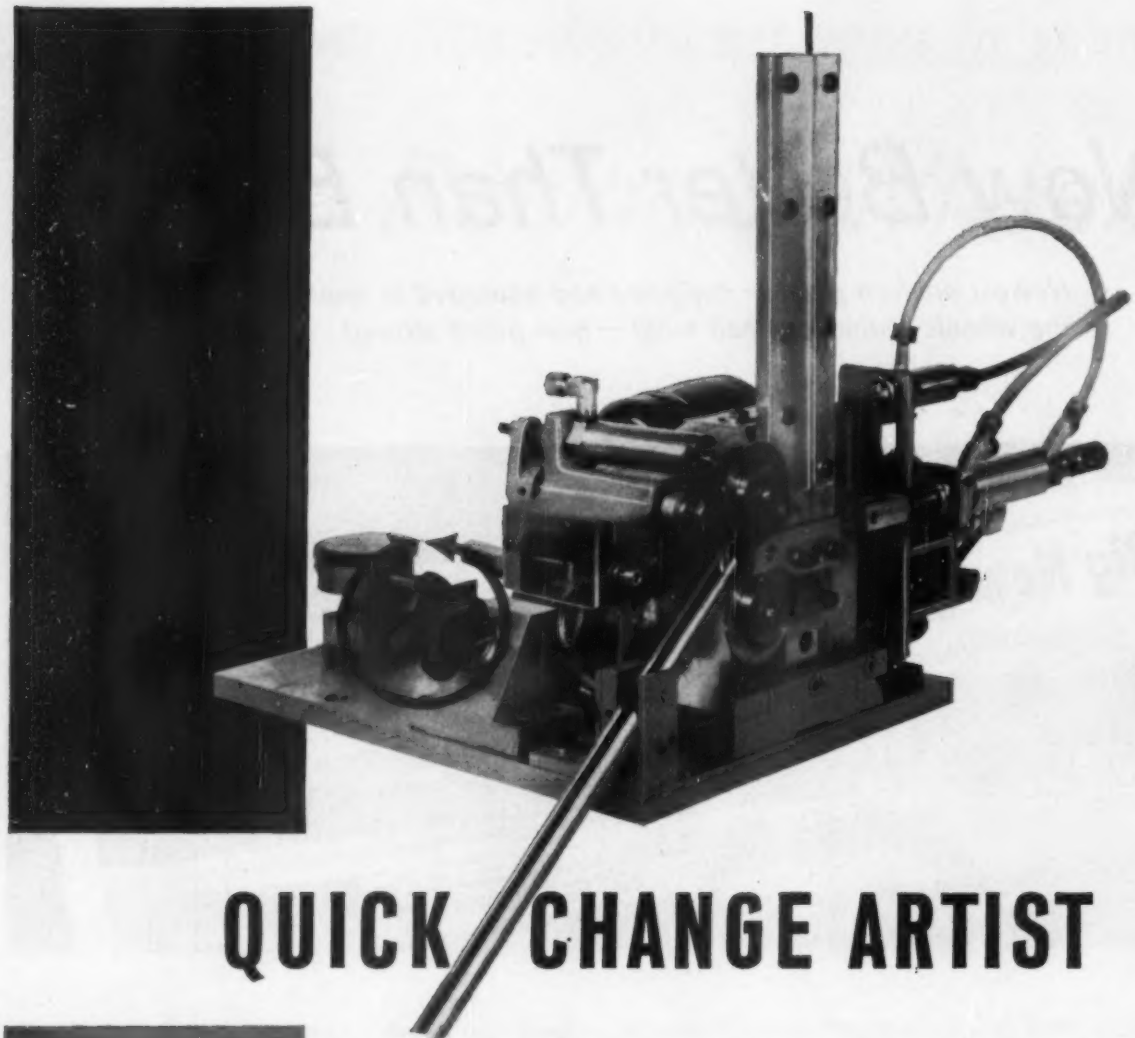
On-the-job reports of how Norton resinoid wheels are paying off in ferrous and non-ferrous foundries are in the new report, Norton High Speed Resinoid Wheels for the Foundry, shown here. Your copy is available from your local Norton Representative . . . and is as near as your phone. Call for it today. NORTON COMPANY, General Offices, Worcester 6, Massachusetts. Plants and distributors around the world.

NORTON
ABRASIVES

W-1966

75 years of . . . Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — BEBR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes



QUICK CHANGE ARTIST

Here's "packaged tooling" for internal grinding that's really versatile. With the turn of a single knob, fixtures can be interchanged to permit rapid set-up away from the machine. Production continues with hardly an interruption.

Quick change "packaged tooling" is only one of the many exclusive features of the Bryant Model "B" Centalign® — features which are helping manufacturers of miniature components establish new records for accuracy and production.

If you are grinding the bores or raceways in miniature bearings or similar parts, investigate the Bryant Model "B" Miniature Centalign. It will repay you in increased profits.

P.S. Space is no problem with the Bryant Miniature Centalign. It packs all its job-engineered features in only 8¼ square feet.

BRYANT Chucking Grinder Co.

85 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Springfield, N. J. • Cleveland • Detroit • Indianapolis • Chicago • Los Angeles

Internal Grinders • Special Machinery

WHY BUY METAL YOU DON'T USE?

Switch to Allegheny Ludlum Cast-to-Shape Tools

FORGED DISC

Forged disc necessary for fabricating welded tube mill roll.

CAST-TO-SHAPE TOOL STEEL

Cast-to-shape welded tube mill roll. 220 lbs. lighter than forging; $780 cheaper for finished shape.

$780 Saved by changing to Cast-to-Shape

Why pay for metal that ends up chips on your floor? Here are two pertinent reasons why you should stop hogging your complex tools from blocks of metal and let Allegheny Ludlum cast them to shape.

CAST-TO-SHAPE MEANS YOU BUY FEWER POUNDS OF METAL.

For example, the roll shown above is 220 pounds *lighter* in the rough state than its forging cousin. Allegheny Ludlum cast-to-shape tools are more economical than tool steel forgings, *and* just as strong in certain applications.

CAST-TO-SHAPE MEANS LESS FINISH MACHINING.

This is especially important with a complex shape. For instance, the casting above has only ¼ to ⅛ inches of machine stock on its surfaces, requiring only one roughing and one finishing operation. Estimated savings by using an Allegheny Ludlum cast-to-shape tool amount to $780.

VSW 7271

Allegheny Ludlum, a tool steel producer who makes cast-to-shape tools, casts them with the same precise quality control for which their tool steels is known. A full line of cast-to-shape tool steel grades is available. You'll find ones with high resistance to abrasion, compressive strengths of approximately 400,000 psi, easy machinability, hardening with almost no distortion, toughness, high red hardness, and the capacity to take a high polish.

Find out now how you can cut costs on your complex tools. Write for FC-4, a 28-page technical discussion of A-L's Forging and Casting Division with applications, pattern information, design tips, analyses, and heat treating instructions. Or call your nearest A-L tool steel warehouse or distributor.

ALLEGHENY LUDLUM STEEL CORPORATION, OLIVER BUILDING, PITTSBURGH 22, PENNA.
Write to Dept. AM-5-2

ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country . . . Check the yellow pages

EVERY GRADE OF TOOL STEEL . . . EVERY HELP IN USING IT

CIRCLE 182 READER SERVICE CARD

CIRCLE 183 READER SERVICE CARD ►

NATCO
B
A

From one pushbutton station, the line operates as a single unit, but each machining element has its own controls for independent operation.

A "medium" production transfer line like this can be built by adding as little as 12½ per cent to the cost of the individual machines.

New Convertible Transfer Line Trims Costs of "Medium" Production

By linking four standard Natco multiple-spindle drilling machines with transfer devices, Caterpillar Tractor Co., Peoria, Ill., has substantially reduced the cost of drilling and reaming diesel cylinder blocks. The transfer line incorporates three standard Natco 2-way machines and one vertical C4B.

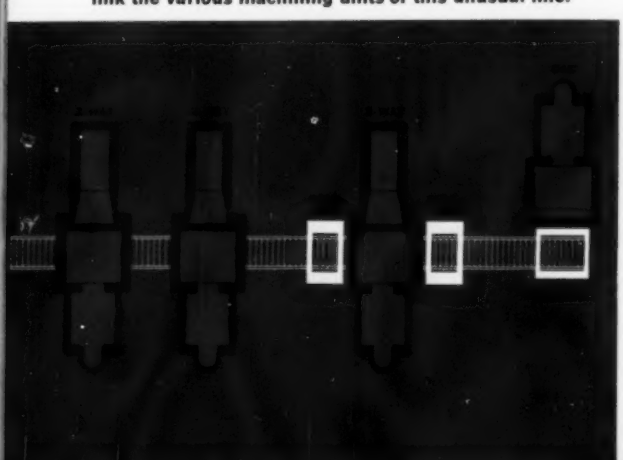
Each machining unit is self-contained with its own hydraulic and electrical system. Machine units can be interchanged or removed from the line for independent operation. Transfer links are standard Natco types.

Take advantage of this new approach to "medium" volume production by calling your Natco representative. Write for bulletin No. 100.

NATCO

The National Automatic Tool Company, Inc., Richmond, Indiana

Rollover, shuttlebar, and walking beam transfer devices link the various machining units of this unusual line.

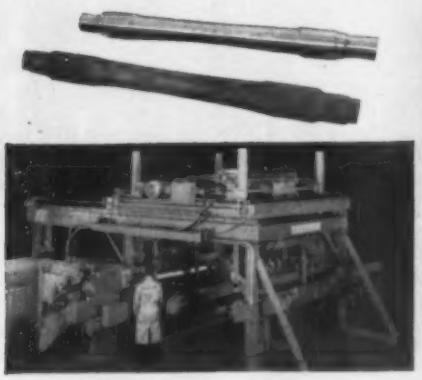


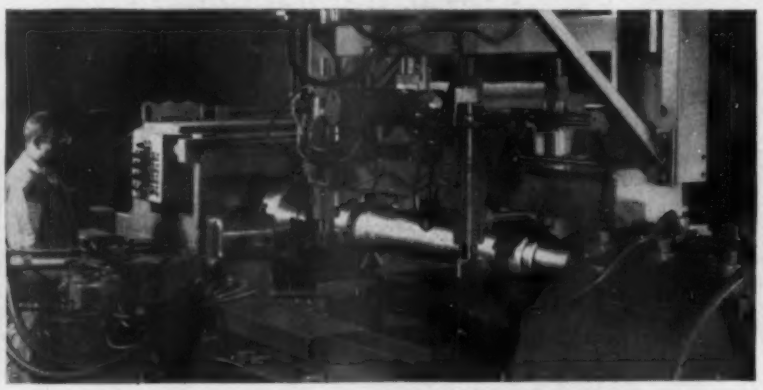
Rollover device repositions cylinder block. Other Natco transfer devices resolve the loading differences between machining units, providing both in-line and cross-line motion.

SUNDSTRAND "Engineered Production" METHODS

...practical ideas for men who are responsible for manufacturing quality, quantity, and profit

TRACER TURNING *300-hp tracer lathe automatically loads, turns, and unloads 1800 lb. locomotive axle forgings*





Over 400 lb. of stock is removed from 1800 lb. locomotive axle forgings in an 11 minute cycle on this 300 hp Sundstrand tracer lathe. Parts are loaded, tracer turned and unloaded in a completely automatic cycle. Forgings range from 4 to 12 inches in diameter and 6 to 9 feet in length.

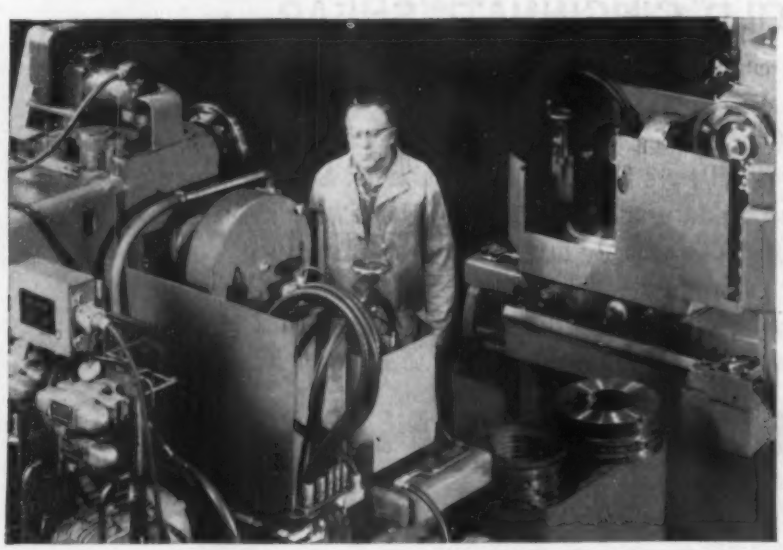
Ends are milled to length and centered prior to turning. With this new Sundstrand Lathe, production increase averages 4 to 5 times over previous method of turning these shafts.

The machine has one front and one rear tracer slide, each controlled from templates which are easily changed for varying sizes of workpieces.

A similar Sundstrand lathe is used for finish turning the axles.

For details on Sundstrand tracer lathes, ask for Bulletin T-115.

ROTARY SURFACE GRINDING *Operator runs two machines to ruff and finish grind 14" clutch plates at 45 per hour.*



These two 20 hp Sundstrand-Arter grinders have the rigidity and power necessary for heavy cuts and fast stock removal. They ruff and finish grind clutch plates to an over-all flatness of .001", total indicator reading — repeatability within ± .0005". Required finish of 30 to 40 microinches is easily held; but finer finish is obtainable with these machines. Stock removal is from .009" to .012" per side.

The entire cycle is automatic except for load and unload, including fast feed for heavy stock removal with automatic change to slow speed for fine finish. When one side is finished on the first machine, the operator simply turns it over and positions it on the magnetic chuck of the second machine. Production is 45 pieces per hour per side per machine at 85% efficiency. *Ask for Bulletin G-115.*

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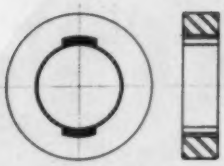
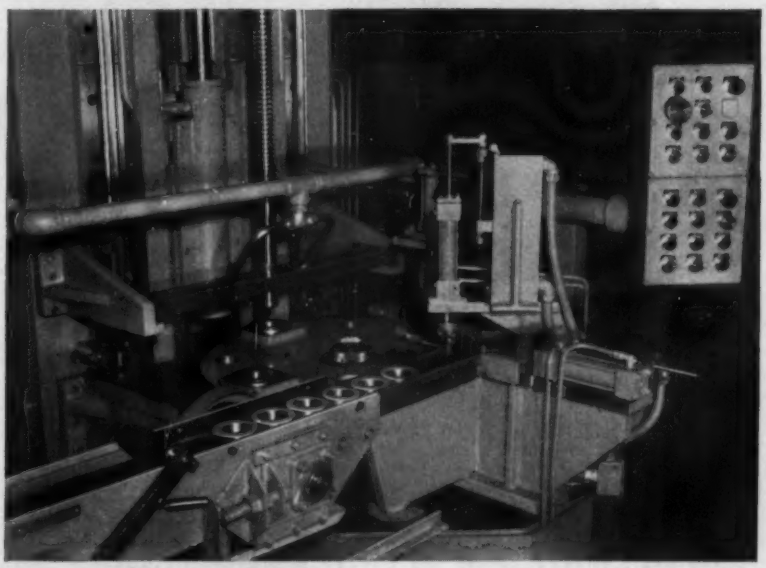
INTERNAL BROACHING

Fully automatic cycle loads, broaches, and unloads gear blanks three at a time





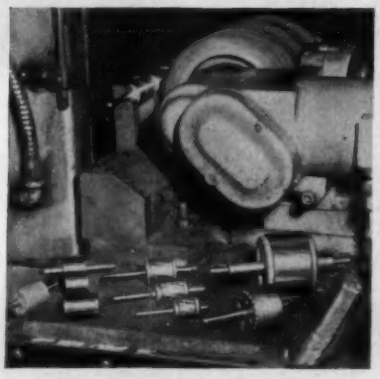
The ID and two splines are automatically broached at a rate of 350 per hour (at 100% efficiency) by this Sundstrand-American machine.

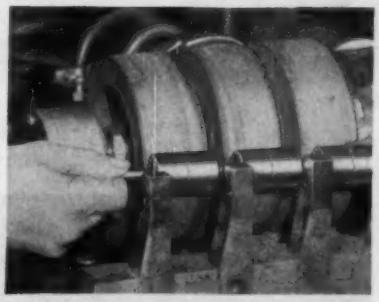
Parts are fed into a fixture by belt conveyor, stacked three high, indexed, machined, and ejected onto the outgoing conveyor. The entire cycle is fully automatic. While parts are being loaded at one station, other parts are being broached. The machine also is equipped with automatic chip conveyor.

Bulletin No. B-115 describes Sundstrand-American vertical and horizontal broaching machines.

CYLINDRICAL BELT GRINDING

Production increased 500%; equipment cost cut 60%; floor space reduced 50%





Use of a special cylindrical grinding fixture mounted on the automatic in-feed table of this Sundstrand-Engelberg belt grinder provides grinding of electric motor rotors to a tolerance of .0002 to .0004″. Diameters are accurate to ±.0005″. Rotors without shaft are mounted on an arbor, as shown at right. Rotors with shafts, at left, are held on their own shafts. A production cycle takes as little as 12 seconds.

The savings listed above are not uncommon wherever Sundstrand-Engelberg precision abrasive belt grinders can be employed to replace other classes of equipment. Literature available upon request.

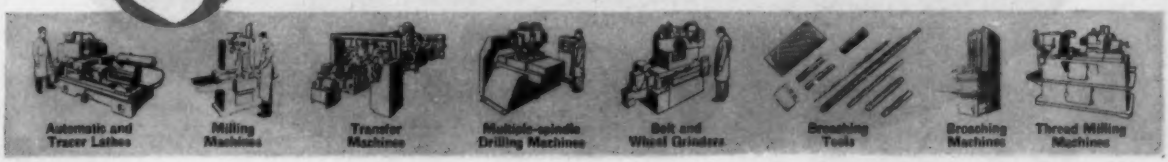
THE CASE STUDIES LISTED HERE ARE TYPICAL OF THE RESULTS ACHIEVED THROUGH SUNDSTRAND'S "ENGINEERED PRODUCTION" SERVICE WHICH ANALYZES YOUR MACHINING REQUIREMENTS AND ESTABLISHES THE METHODS AND EQUIPMENT WHICH WILL GIVE YOU THE GREATEST OVER-ALL PRODUCTION ECONOMIES.

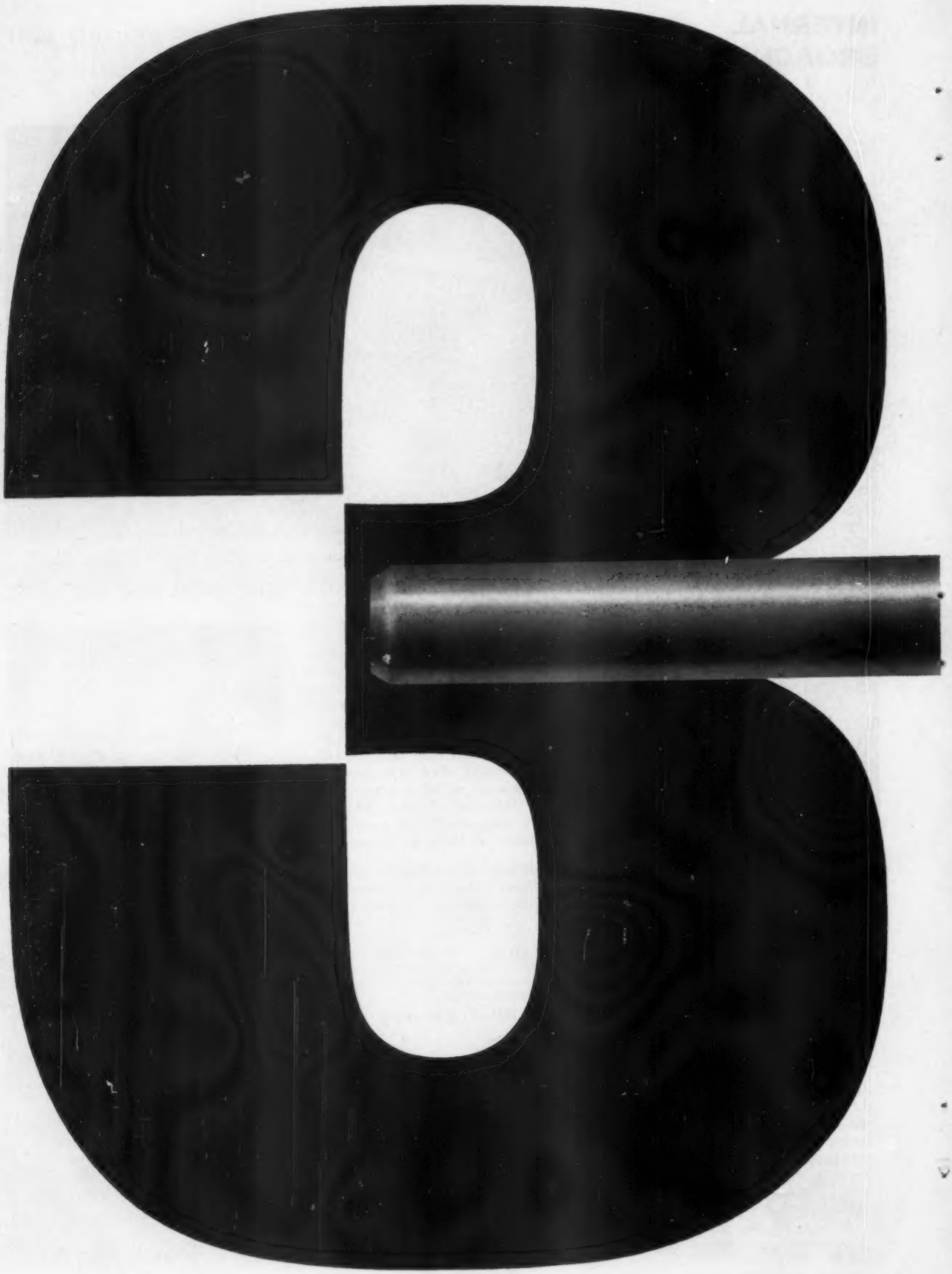
FOR COMPLETE INFORMATION WITHOUT OBLIGATION, WRITE TODAY.

SUNDSTRAND

SUNDSTRAND MACHINE TOOL

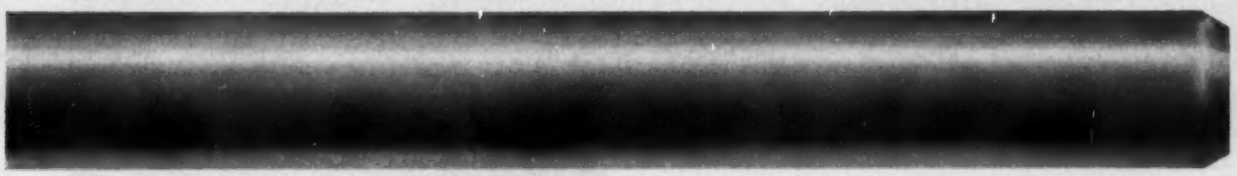
BELVIDERE, ILLINOIS • DIVISION OF SUNDSTRAND CORPORATION





3 NEW ADVANTAGES YOU GET WITH **MICRO-CHIP**

THE NEW KAISER ALUMINUM 2011-T3 SCREW MACHINE STOCK



1 **PROCESSED FOR EASIER MACHINING** • Micro-Chip is alloy 2011-T3 stock produced by a unique process that improves machinability—gives finer, smaller chips. Speeds your production . . . saves wear on your equipment.

2 **BOTH ENDS OF BAR CHAMFERRED (Most sizes)** • Now you can feed either end of the bar into the machine! Eliminates extra handling and awkward flip-flopping, and reduces feed finger wear. Comes in 12-foot lengths, up to 3-inch diameter and 2-inch hex in standard 200-pound packages.

3 **NEW BRIGHTER, CLEANER SURFACE** • Automatically gives the parts you produce an improved finish in areas where no stock is removed. Permits cleaner handling in your shop . . . saves you finishing time and work . . . may allow you to make lower bids.

KAISER ALUMINUM

*TRADEMARK OF KAISER ALUMINUM & CHEMICAL CORPORATION

THIS LABEL IDENTIFIES MICRO-CHIP • Kaiser Aluminum Micro-Chip is now available through Kaiser Aluminum and Kaiser Aluminum Distributors—**at no extra cost.** Ask for it by name and look for this label.

BRIGHTER CLEANER

MICRO-CHIP

2011-T3

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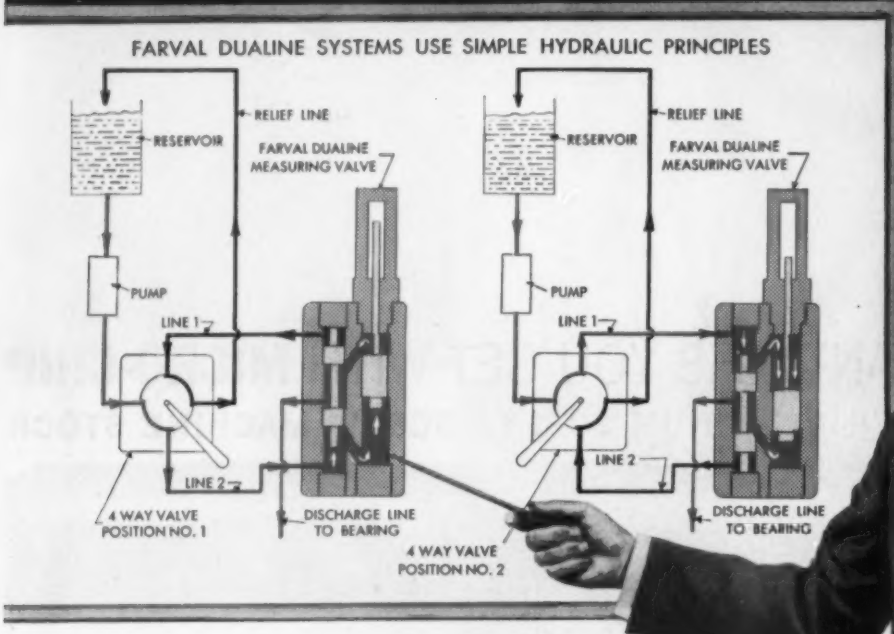
See "MAVERICK" • Sunday Evenings, ABC-TV Network • Consult local TV listing

FARVAL
—Studies in Centralized Lubrication
No. 246

"For positive lubrication of large, medium and heavy-duty installations . . . it's a Farval Dualine System!"



With Farval Dualine centralized lubricating systems you get the following distinct advantages over other type systems . . .

(a) Much lower operating pressures with consequently less danger of soap separation on grease systems. Also, less danger of system damage due to high lubricant pressures.

(b) Large lubricant passages with no pinhole ports, ensures practically full pump pressure for every metering valve. This is one of the reasons why Farval Dualine systems operate on lower pressures — give less sieving and working of lubricants.

(c) Positive indication at each bearing — does not have to depend on the questionable action of a single indicator at the pump.

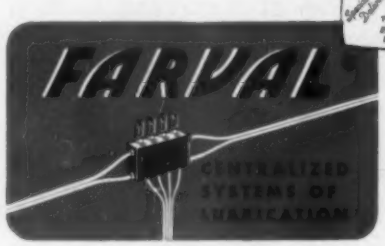
(d) Each metering valve individually adjustable for the requirements of the bearing it serves.

(e) Independent metering valve operation. Should trouble develop with one valve, the system will continue to operate. Only one bearing (not all the bearings) will require hand lubrication until trouble is corrected.

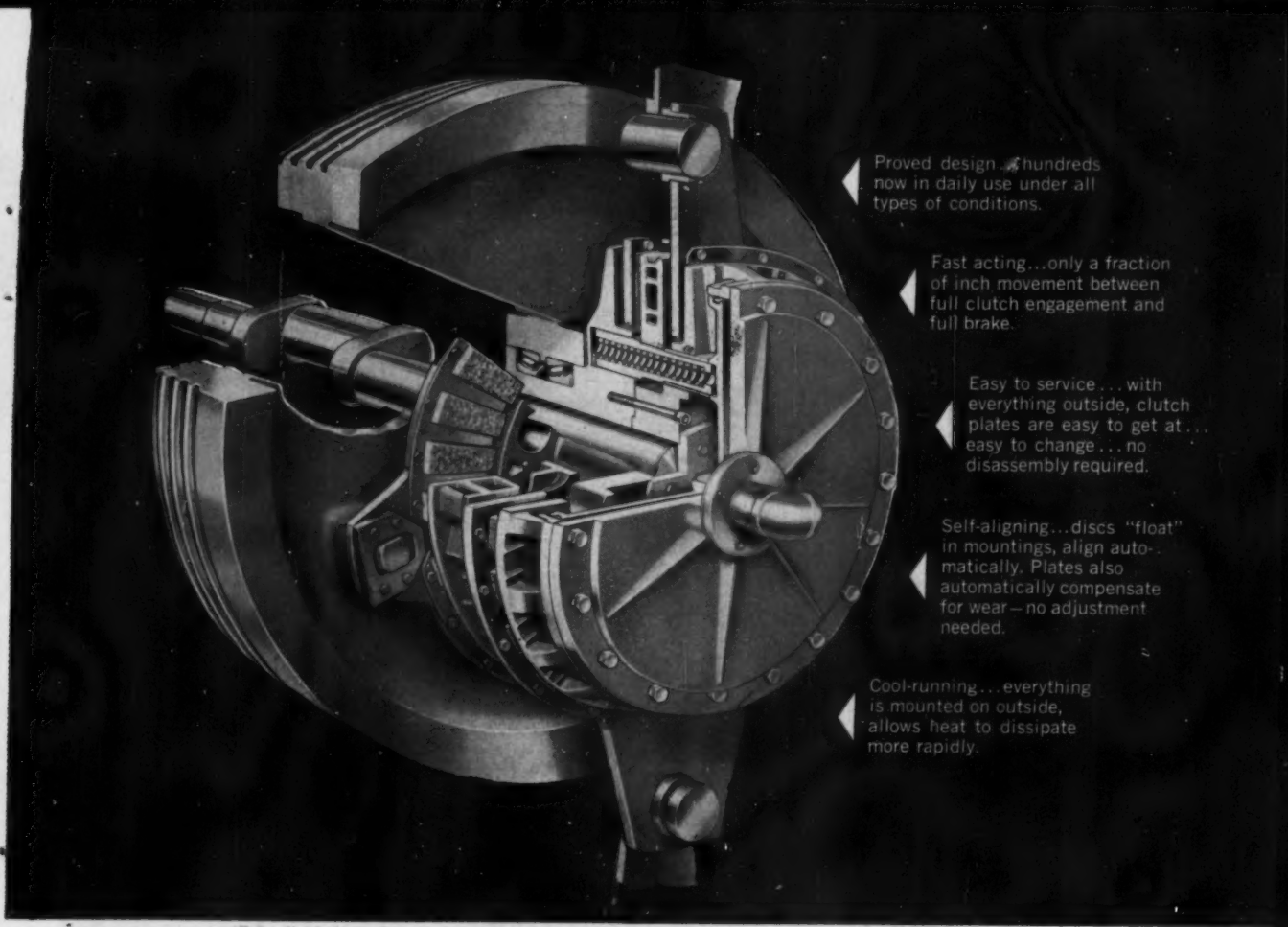
(f) True lubricant metering. Quantity of lubricant delivered to one bearing is not dependent on any other valve in the system.

(g) Much easier to spot and correct trouble.

Check with your Farval Representative and see how these versatile systems can improve production operations — reduce costs. Or write for free Bulletin 26-T containing complete engineering information on Farval Dualine systems.



Farval Division
Eaton Manufacturing Company
3254 East 80th Street • Cleveland 4, Ohio


Proved design . . . hundreds now in daily use under all types of conditions.
Fast acting . . . only a fraction of inch movement between full clutch engagement and full brake.
Easy to service . . . with everything outside, clutch plates are easy to get at . . . easy to change . . . no disassembly required.
Self-aligning . . . discs "float" in mountings, align automatically. Plates also automatically compensate for wear—no adjustment needed.
Cool-running . . . everything is mounted on outside, allows heat to dissipate more rapidly.

New Bliss combination clutch and brake for inclinables...

RUNS COOLER UNDER TOUGH OPERATING CONDITIONS
SINGLE TRIPS FASTER . . . ALWAYS TOP STOPS!

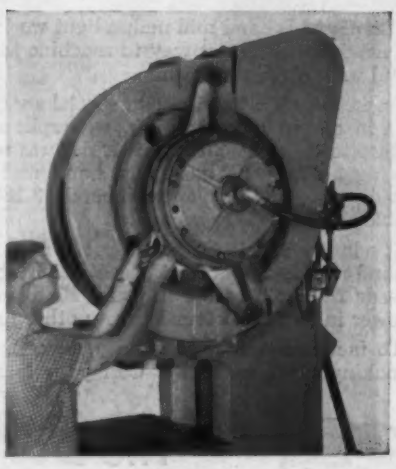
Here is a new combination clutch and brake that is rewriting the standards for inclinable press production.

It's an exceptionally fast operating clutch . . . one that licks the usual maintenance problems associated with high speed clutches.

Everything is mounted on the *outside* . . . the clutch is thus kept in open air *away* from the press frame . . . it dissipates heat far faster and there is no danger of bearing oil getting on the clutch plates—both factors that contribute to longer life.

An equally important feature is its universal top stopping. It practically eliminates the possibility of damaging dies through double-tripping; the new CK top stops every time; ram and feeds are always in synchronization.

Bliss' new CK clutch is designed for crankshaft mounting on flywheel inclinables and main gear mounting on geared inclinable presses. In either case, it runs faster *longer*. Why not get the complete facts on this important new development today?



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SINCE 1837

E. W. BLISS COMPANY · Canton, Ohio

BLISS is more than a name—it's a guarantee

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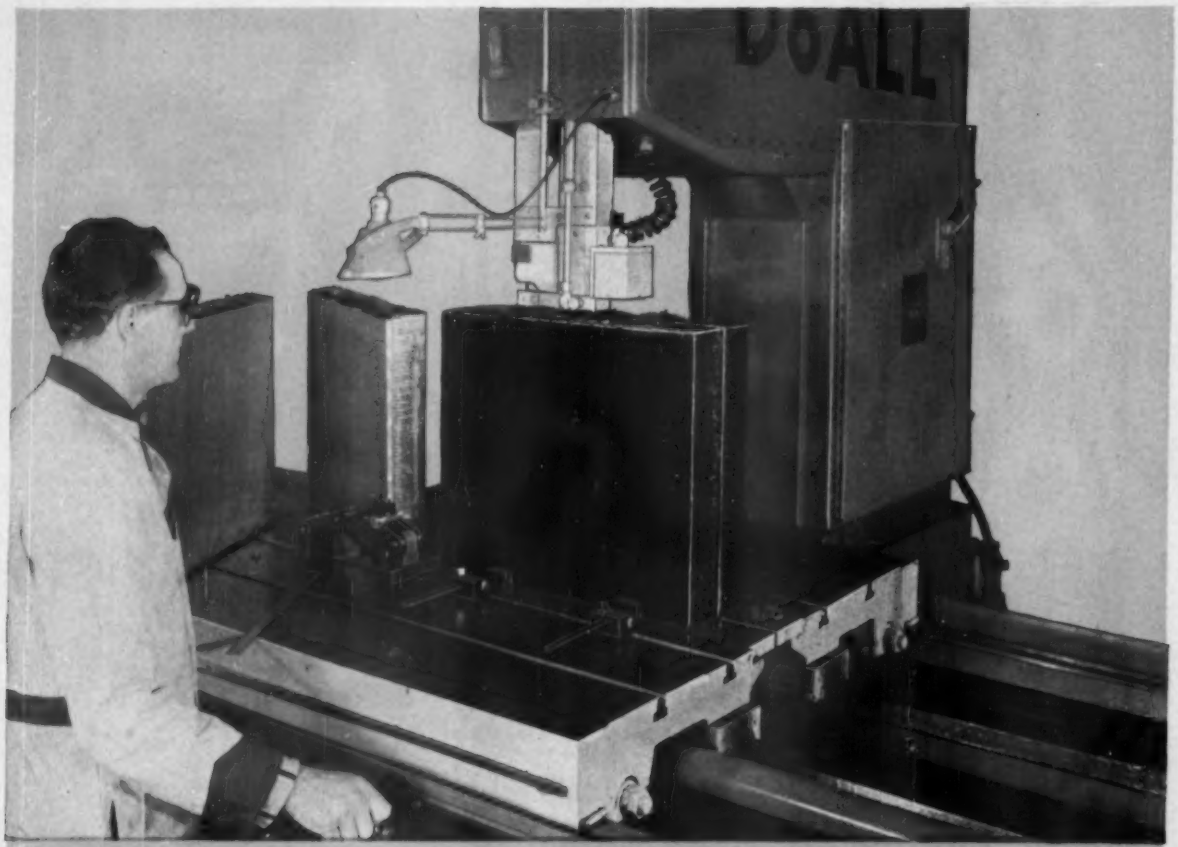
CIRCLE 192 READER SERVICE CARD



Half-Ton Slabs of Tough Analysis Steel Split in ½ Hour on DoALL Band Mill

This DoALL band mill makes light work of heavy sawing jobs. It offers a new, fast, low-cost way to machine king-size workpieces—accurately and with excellent finish.

Seven large blocks of tough, special analysis steel, each 19¾ in. x 23 in. x 7 in. and weighing 1,000 lb., were split at a cutting rate of 5 sq. in./min. Despite this fast cutting rate, flatness was held within .010 in. T.I.R., using a Demon® h.s.s. saw band and DoALL No. 240 cutting oil. After seven cuts, or approximately 3,180 sq. in., there was no appreciable wear on the saw band.

The large-capacity, variable-speed fluid drive worktable of the DoALL band mill supports workpieces weighing up to 4,000 lb.—with positive feeds from .03 to .80 in./min. Fixturing and power consumption are lower in cost than found in any other machining method.

To increase your productivity, investigate this money-saving, money-making machine today. Call your local DoALL Sales-Service Store.

All machine functions of the DoALL band mill are controlled from the station shown above. Additional controls are located on the column.

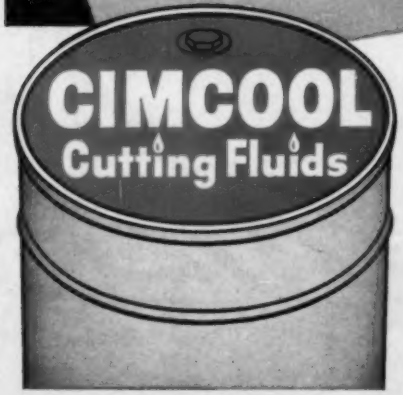
B-64

The DoALL Company, Des Plaines, Illinois

Heavy-Duty Improvement!

New chemical cutting fluid CIMPERIAL scores another success as a replacement to a cutting oil, in a heavy duty application. (Company name on request)

SALES REPORT
2.
on automatic screw machines. The operation was turning of stainless steel automotive water pump shafts. They were getting a lot of smoke and spray with a straight cutting oil.
We installed Cimperial at a 1:20 dilution. The result was an excellent job with no smoke and the work area much cleaner. No more slippery floor either. Cimperial left the parts so clean that an entire washing operation was eliminated.
Norm Schuckt
Cincinnati Office



FOR 100% OF ALL METAL CUTTING JOBS

Production-proved products of The Cincinnati Milling Machine Co.

CIMCOOL S2 Concentrate — The pink fluid which covers 85% of all metal cutting jobs.
CIMPERIAL* — Newest in the famous, industry-proven line of CIMCOOL* Cutting Fluids.
CIMPLUS — The transparent grinding fluid which provides exceptional rust control.
CIMCUT Concentrates (AA, NC, SS) — For every job requiring an oil-base cutting fluid.
ALSO — CIMCOOL Tapping Compound — CIMCOOL Bactericide — CIMCOOL Machine Cleaner.

For full information on the complete family of CIMCOOL Cutting Fluids, call your CIMCOOL Distributor. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

*Trade Marks Reg. U. S. Pat. Off.

Milwaukee-Matic

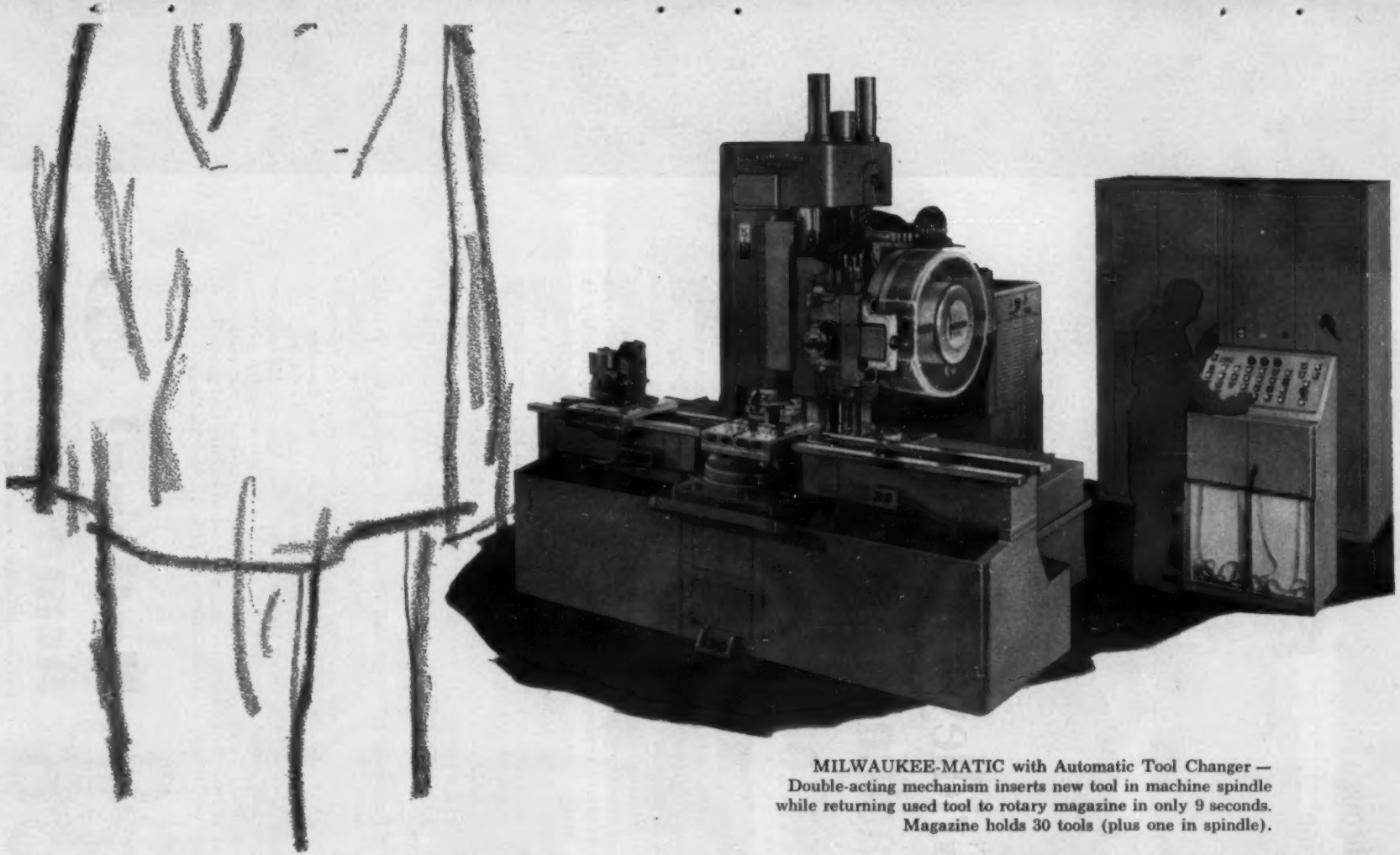
"Just A Minute

. . . while I mill, drill, ream, tap, bore, counterbore, countersink and spotface a part automatically."

"Sure, the job could be done on a variety of separate machines and fixtures — plus a lot of expensive setup and transfer time . . . but why make a project of it? With the Kearney & Trecker MILWAUKEE-MATIC, you do the whole job automatically, on a single integrated machine . . . under numerical control, of course. With punched tape control, each workpiece is precision-finished exactly like the one before it . . . accurate to tenths."

If your schedules call for small- and medium-lot runs of parts requiring a variety of machining operations, you'll want to know more about the profit-producing MILWAUKEE-MATIC . . . a new manufacturing concept. Investigate, and you, too, will be saying, "Just a MILWAUKEE-MATIC minute . . . while I mill, drill, ream, tap, bore . . . "

Write for complete literature file or call your local Kearney & Trecker representative today.



MILWAUKEE-MATIC with Automatic Tool Changer — Double-acting mechanism inserts new tool in machine spindle while returning used tool to rotary magazine in only 9 seconds. Magazine holds 30 tools (plus one in spindle).

Numerical Control Division

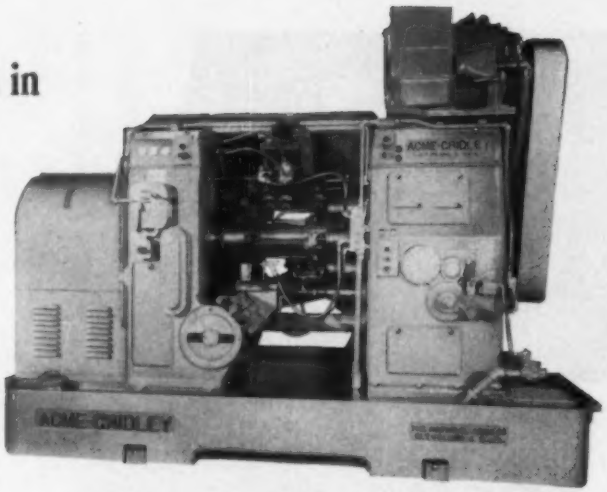
KEARNEY & TRECKER CORP.

6800 West National Avenue • Milwaukee 14, Wisconsin

Phone — GReenfield 6-8300 . . . Direct Distance Dialing Code No. 414

KEARNEY & TRECKER MILWAUKEE

Major breakthrough in shaft production . . .



Acme-Gridley multiple-spindle shaft machine equals output of four automated lathes

At Chrysler Corporation's Trenton, Michigan, Engine Plant, a remarkable new National Acme shaft turning machine has slashed camshaft production costs; is hailed as a major production development for the entire industry. Performing complete shaft journal machining in a single set-up, this rugged 6-spindle automatic provides substantial savings in floor space and capital outlay, reduces scrap loss and enables closer control of machining operations.

Key to this dramatic pay-off are imaginative National Acme solutions to the difficult problems of centering, driving, and stabilizing the long, flexible shaft during turning operations. An ingenious part-holding technique exposes bearing journals for turning—an impossibility in a chucking set-up.

Extreme capability is stressed in the design of the Universal Multiple-Spindle Shaft Turning Machine and permits the maximum number of machining operations to be performed on straight or flanged shafts held between centers.

The shaft turning machine is additional evidence of National Acme know-how applied to the solution of special machining problems. This same insight and ability is available to any manufacturer interested in reduced costs and increased production. Our representative is as close as your telephone.

National Acme's "Zone of Responsibility" includes all phases of cost reduction. Check YOURS . . . Then Check National Acme

Direct Costs: these include direct dollar savings as realized by Chrysler Corporation . . . an "everyday" job for Acme-Gridleys. **Indirect Costs:** effecting important savings in maintenance, downtime, scrap reduction, tool costs, etc. **Product Redesign:** teaming with your design group to take full advantage of Acme-Gridleys' cost reducing capabilities. **Direct Material Costs:** our engineers provide important savings in this area by constantly matching machines and tools to modern metallurgical problems. **Make-or-Buy Reviews:** in many cases our Contract Division can assume your production headaches and relieve you of immediate capital investment. **Spot Modernization:** pioneering in modern tooling methods, and the flexibility of Acme-Gridleys can provide many "on-the-spot" savings.

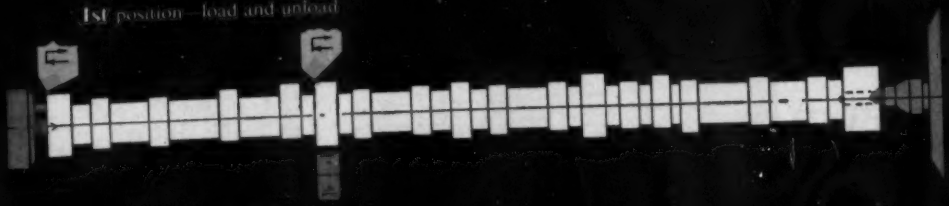
National Acme

MMT=PE

The National Acme Company
171 E. 131st Street
Cleveland 8, Ohio

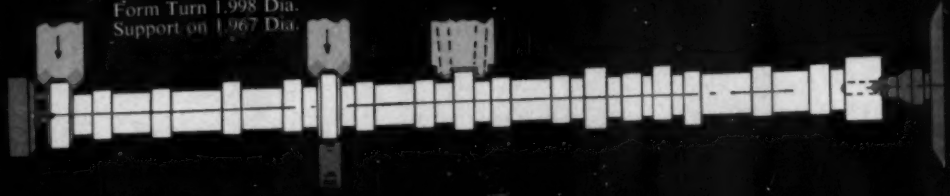
Sales Offices: Newark 2, N.J.; Chicago 6, Ill.; Detroit 27, Mich.

1st position—load and unload

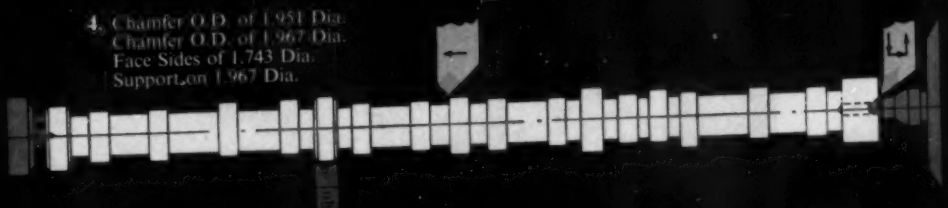


2. Form Turn 1.951 Dia.
Form Turn 1.967 Dia.

3. Form Turn 1.982 Dia.
Form Turn 1.998 Dia.
Support on 1.967 Dia.



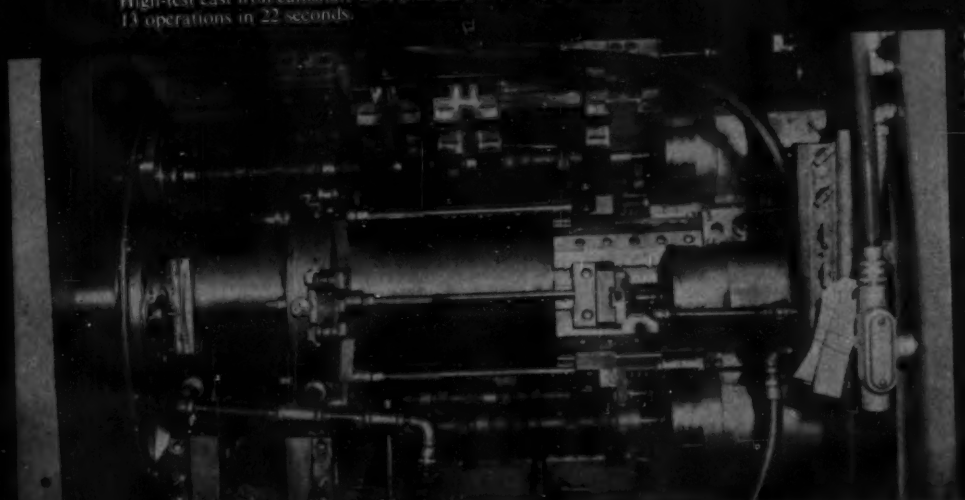
4. Chamfer O.D. of 1.951 Dia.
Chamfer O.D. of 1.967 Dia.
Face Sides of 1.743 Dia.
Support on 1.967 Dia.



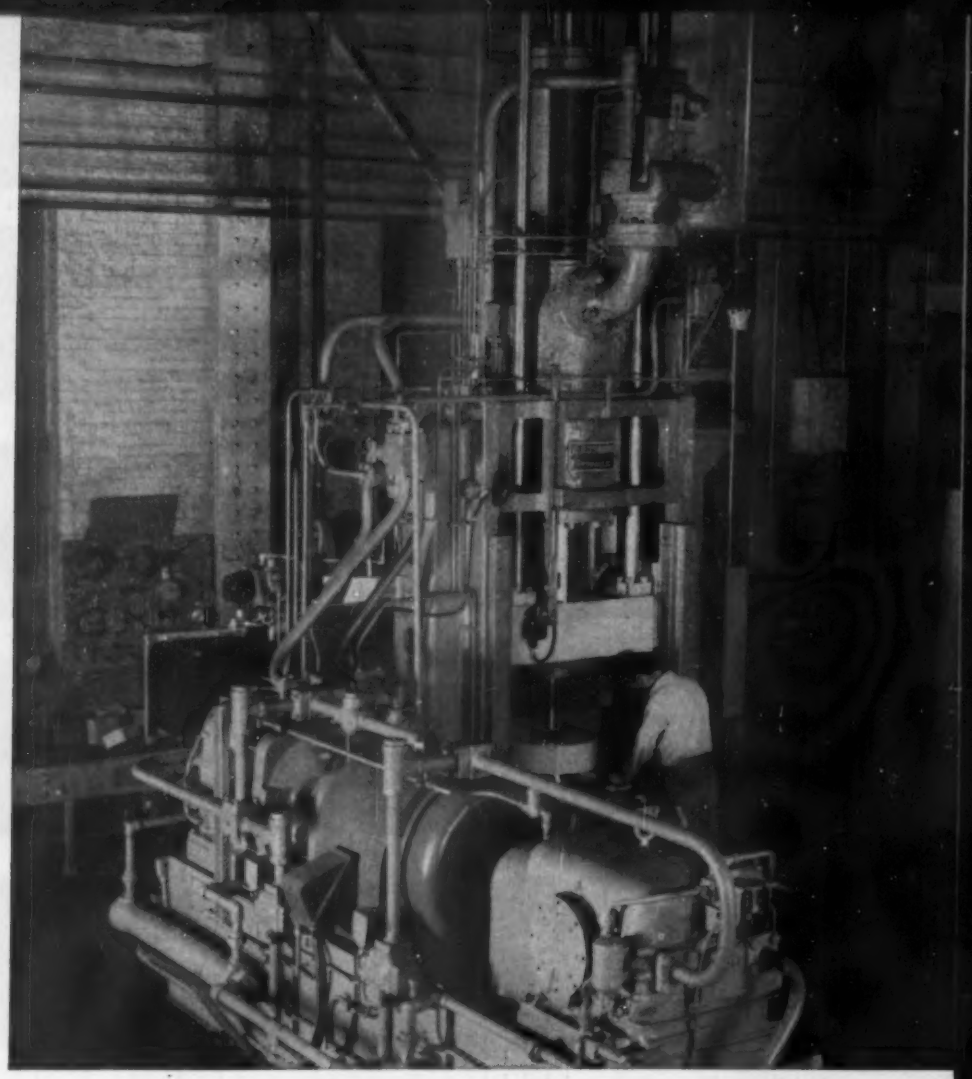
5. Face End of Camshaft
Relieve Turn 1.743 Gear Dia.
Support on 1.967 Dia.

6. Chamfer O.D. of 1.743 Dia.
Chamfer O.D. of 1.982 Dia.
Chamfer O.D. of 1.998 Dia.
Support on 1.967 Dia.

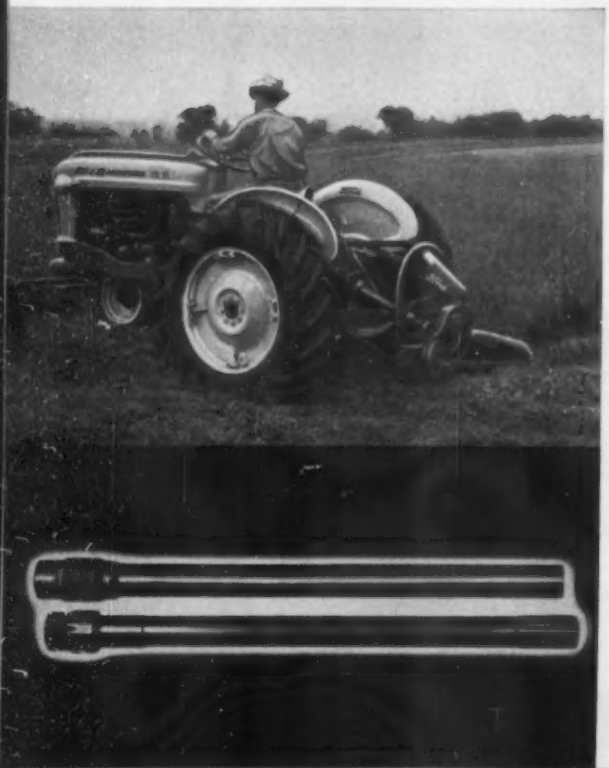
High-test cast iron camshaft with journal machining completed. 13 operations in 22 seconds.



Close-up of tooling zone. Open spindle in load and unload position shows unique centering, holding and driving mechanism.



This 500-ton hydraulically operated press built by Birdsboro Steel Foundry & Machine Company, Birdsboro, Pa., and featuring Republic ELECTRUNITE Hydraulic Fluid Line Tubing, is used by a leading research center for deep drawing, extruding, or planishing metals.



REPUBLIC DIE-FORM CUTS PRODUCTION COSTS. Ford Tractor Power Take-Off Counter-Shaft costs less to produce using a Republic Die-Form Blank, as compared to previous materials. Because Republic Die-Form Blanks closely approximate the completed part, they minimize required machining and reduce handling costs. In addition, the nature of the Die-Form Process improves machinability of any given analysis, permitting further savings through use of higher speeds and feeds. Photo below shows a Die-Form Blank and the completed shaft as featured in the Ford Tractor. Write for Die-Form Folder ADV-746.

REPUBLIC CAP SCREWS PROTECT SHAKER SCREEN PERFORMANCE. Sorting and sizing ton after ton of jolting, jarring, abrasive material is all in a day's work for Ty-Rock Vibrating Screens, built by The W. S. Tyler Company, Cleveland, Ohio. Satisfactory performance under these brutal conditions not only requires design and manufacturing skill, but a thorough knowledge of materials. Maximum performance under all operating conditions is typical of Republic's complete line of top-quality Cap Screws. Send coupon for data.

Stubborn resistance to fatigue...

REPUBLIC ELECTRUNITE HYDRAULIC FLUID LINE TUBING

Machine tool builders and operators depend upon Republic ELECTRUNITE® Hydraulic Fluid Line Tubing for stubborn resistance to fatigue. Reason is the *consistent uniformity of concentricity* and mechanical properties of ELECTRUNITE welded steel tubing—characteristics that make this tube better able to withstand the vibrations of rapid multiple cycling.

This uniform concentricity—inherent in the ELECTRUNITE process—coupled with uniform heat treatment, insures uniform flaring characteristics. Uniform ductility assures easy bending. Both mean savings in original and in replacement installations.

You can recognize this best of all hydraulic line tubing by the blue spiral marking stenciled end-to-end on every length. It is your assurance of genuine ELECTRUNITE quality. The spiral marked tube is available in all sizes shown in JIC Standards, and is produced in a wider size range to Specification HL-1, which meets all JIC Standards test requirements.

Get all the facts. Discover how Republic ELECTRUNITE Hydraulic Fluid Line Tubing can substantially reduce maintenance costs in the most complicated installations. Call your Republic representative, or send coupon for additional information.

REPUBLIC WEDGE-LOCK PARTS® STORAGE UNITS are easy to load and unload from either side. And, the heavier the load, the tighter the grip, because patented Wedge-Lock construction includes a post that will not buckle, a concealed sway-proof joint, and a reinforced shelf that does not sag. Unlimited shelf arrangements. Capable of exceptionally high stacking. Republic Storage Engineering specialists will help you plan. Call your Republic representative today.

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1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send more information on the following products:

- ☐ Republic ELECTRUNITE Hydraulic Fluid Line Tubing
- ☐ Republic Die-Form—Folder ADV-746
- ☐ Republic Cap Screws ☐ Wedge-Lock Storage Units

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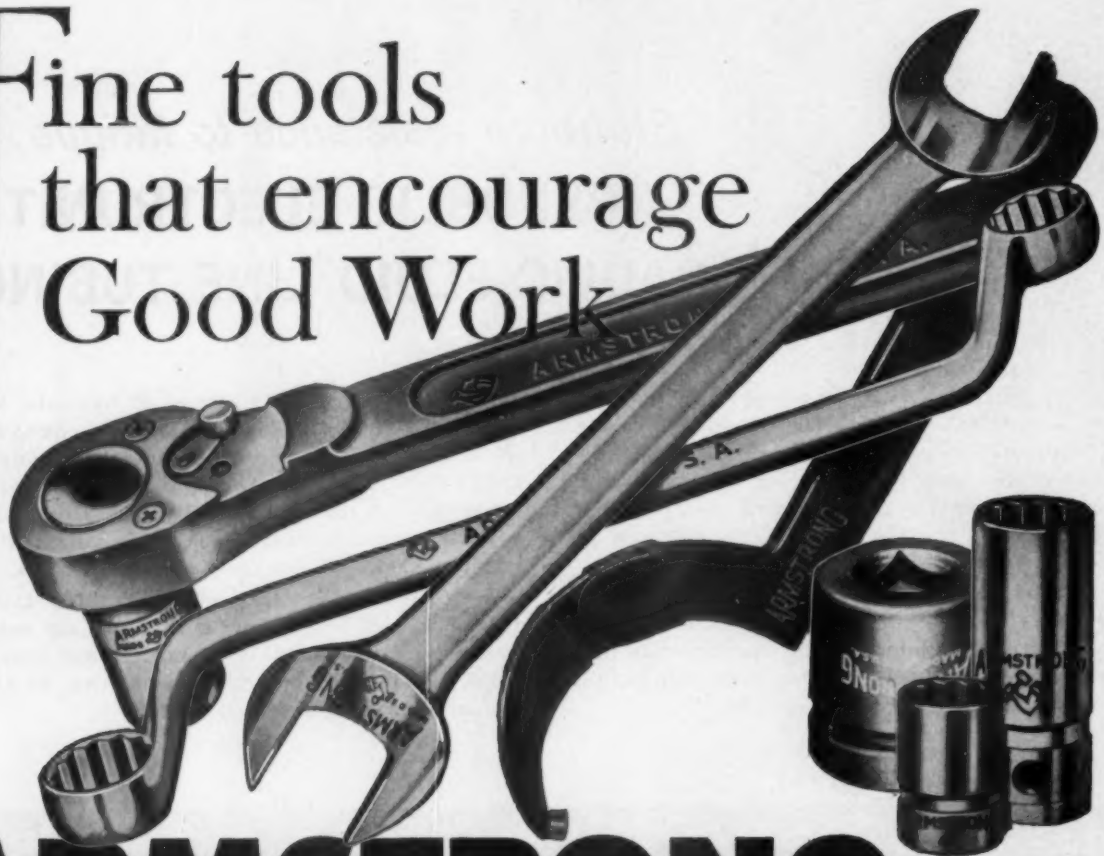
Fine tools that encourage Good Work



ARMSTRONG WRENCHES

An ARMSTRONG Wrench feels right—is balanced. It goes over nuts or screw heads easily, grips firmly without sloppiness, won't round corners—because openings are carefully machined to correct sizes. It's safe, strong beyond need without clumsy bulk—because of superior design and selected steels, heat treated to proper degree of hardness and tensile strength. It's quality finished, ARMALOY (alloy steel) Wrenches in chrome plate with heads buffed; HI-TEN (carbon steel) Wrenches in baked-on gray enamel with heads ground bright . . . all plainly marked for size. All are uniformly excellent tools manufactured under strict quality control, by modern methods, with modern equipment in a modern tool plant . . . 1537 different industrial sizes and types—single wrenches, or sets in metal cases, boxes or rolls . . . each a quality tool. Armstrong Wrenches are "Fine tools that encourage good work."

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If you don't know your local ARMSTRONG Distributor, we will send you the names of those in your area.

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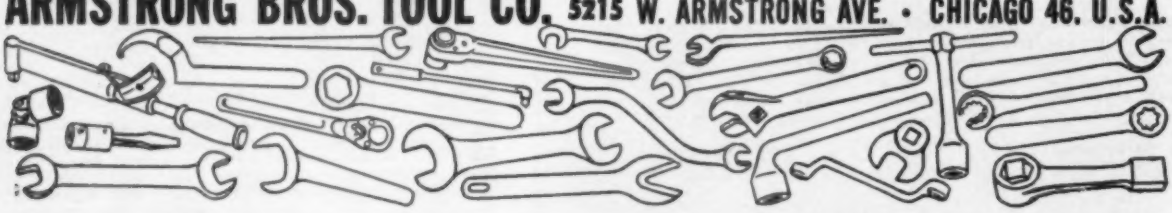

Background For Perfection

Gages do "tell the story" of perfect threads. But back of *that* story you will find holes perfectly drilled, taps properly selected and correctly used, and engineering services freely given.

When tooling any threading job, get the whole story — specify GREENFIELD cutting Tools *and* GAGES.

Write for Greenfield Handbook —"Facts About Taps and Tapping."

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GREENFIELD TAP & DIE

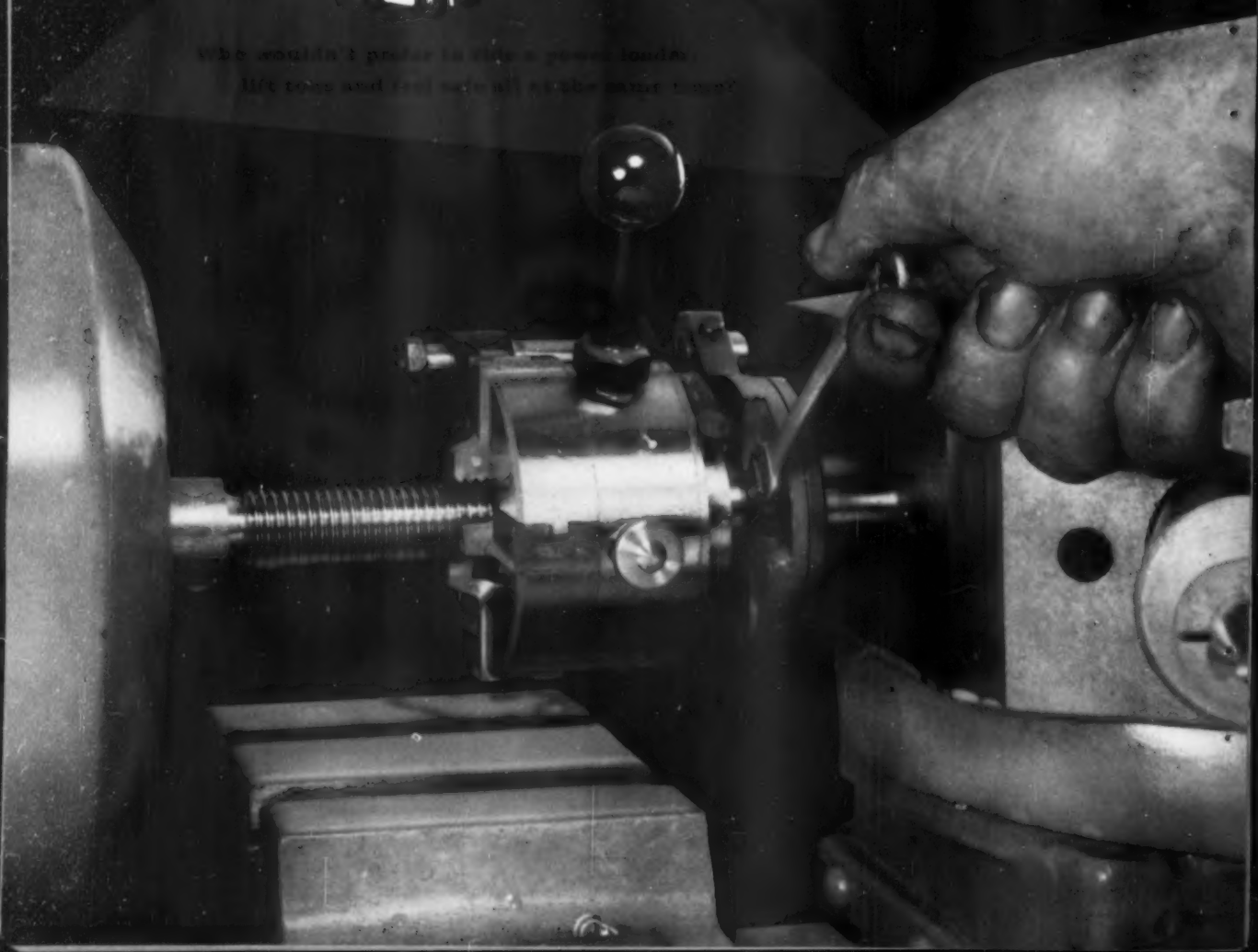
GREENFIELD, MASSACHUSETTS

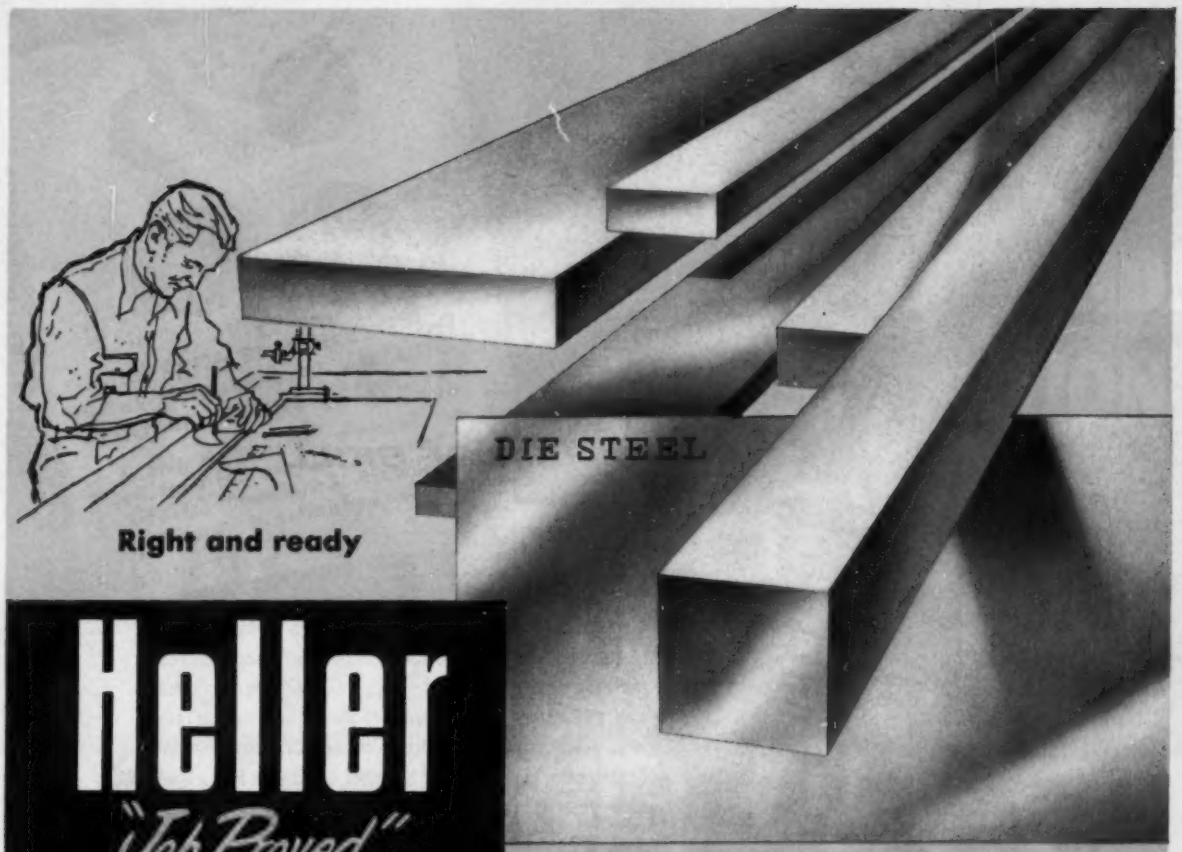
Look around your plant, you'll probably find nobody toting those bars and lifting those bales but be sure you are not trying to produce today's precision threads with antique or worn out die heads. Chances are that a new Geometric would give a lift to more than one threading job.

CALL YOUR GEOMETRIC DISTRIBUTOR TODAY

GEOMETRIC-HORTON

NEW HAVEN 15, CONNECTICUT





Right and ready

Heller

"Job Proved"

FLAT GROUND

DIE STEEL

SLASHES PREPARATION TIME . . . CUTS TOOL MAKING COSTS

PRECISION GROUND FOR IMMEDIATE MACHINING. Heller die steel is spheroidize annealed for quick machining and uniform hardening . . . right and ready for immediate use. Precision ground to a smooth surface finish of less than 35 micro-inches . . . free from defects and decarburization.

COMPLETE RANGE OF SIZES — INDIVIDUALLY WRAPPED. Heller's Oil Hardening and Air Hardening types are available in over 1300 stock sizes in 18" and 36" lengths. Each unit is individually wrapped for maximum protection . . . labeled with easy-to-follow heat treating instructions.

CHOICE OF OIL HARDENING OR AIR HARDENING TYPES. Heller has a flat ground die steel for every requirement. Oil Hardening, type 01 wear-resistant alloy steel for general purposes . . . Air Hardening 5% Chrome type that provides an even higher degree of wearability. Both are recommended for dies, punches, jigs, machine parts and similar applications. Where top-flight performance is a must — Heller's Air Hardening is the answer. It reacts more favorably to heat treatment . . . assures greater margins of safety.

LOW CARBON STEEL IS AVAILABLE TOO. Where heat treating is not a necessity — Heller's fine-grained, silicon-killed, Low Carbon Steel is ideal. Extremely versatile, it is easy to machine and weld.

17-9-6

TAKE THE GAMBLE OUT OF BUYING! Get the double assurance of Heller Die Steel and your Heller Distributor's dependable service the next time you order. They are "sure bets" for complete satisfaction.

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CIRCLE 204 READER SERVICE CARD

A PRODUCT OF SKILL

the complete line Reamers are typical of Butterfield's long-life cutting tools. Also ready for fast delivery are: drills, taps, dies, counterbores, cutters, end mills, hobs and carbide tools. Phone for tools or technical assistance. Warehouses in Chicago, Detroit, Fort Worth, Los Angeles, New York and San Francisco. **Call your Butterfield Distributor.**

BUTTERFIELD

DIVISION, Union Twist Drill Company, Derby Line, Vt.

HERE ARE PROGRESSIVE STEPS IN THE EXTRUSION OF AN AUTOMOTIVE BEARING RACE

1. Slug starts as ¾" diameter cut-off from coil stock. 2. Impacted to 1-1/16" diameter. 3. Extruded to configuration. 4. Finished extrusion.

"in COLD EXTRUSION SUCCESS DEPENDS ON LUBRICATION"

and success is yours when you use

EXTRUDOIL #51 DO CONCENTRATE

MACCO EXTRUDOIL #51 DO CONCENTRATE

- **REDUCES PRODUCTION COST . . . INCREASES PRODUCTION DUE TO LESS DOWN TIME BECAUSE OF TOOL CHANGES**
- **FREER FLOWING OF METAL ASSURES MAINTENANCE OF ABSOLUTE TOLERANCES**
- **CUTS INVENTORY COST — ONE LUBRICANT DOES *ALL* THE JOBS**
- **CUTS DIE TRY-OUT TIME**

Why is Macco Extrudoil #51 DO Concentrate the first choice of experienced cold extrusion men? The answer is easy . . . Macco research and development, working hand-in-hand with leading extrusion equipment manufacturers, developed this Extrudoil to meet the distinct needs of cold extrusion. Result—today Macco Extrudoil #51 DO Concentrate is far ahead of the field . . . proved in production beyond question . . . used every day in the extrusion of screws, bolts, nuts, bearing races, spark plug shells, worm shafts, gears, tappet bodies, sleeves. If you are now engaged in cold extrusion, or even thinking about it, it will pay you well to talk to a Macco engineer. There's one in your area. If you don't know him, write, wire or phone us. We'll have him see you.

Get the facts . . . find out for yourself why

THE METALWORKING INDUSTRY LOOKS TO MACCO FOR LEADERSHIP

MACCO PRODUCTS COMPANY

9201 S. SANGAMON ST., CHICAGO 20, ILLINOIS
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CIRCLE 206 READER SERVICE CARD

EVEN ON THIS EXTRA-TOUGH JOB...

N-A-XTRA

HIGH-STRENGTH STEEL TRIPLES TRUCK LIFE!

Hour after hour, around the clock, the Edward C. Levy Slag Company, Detroit, keeps forty 45-ton trucks working under severe conditions. Nearly 30 tons of hot slag are loaded, lifted and dumped on every trip. Each time, the truck body must stand the sudden shock of drop loading, the stress of lifting that load and the grinding abrasive action as it empties.

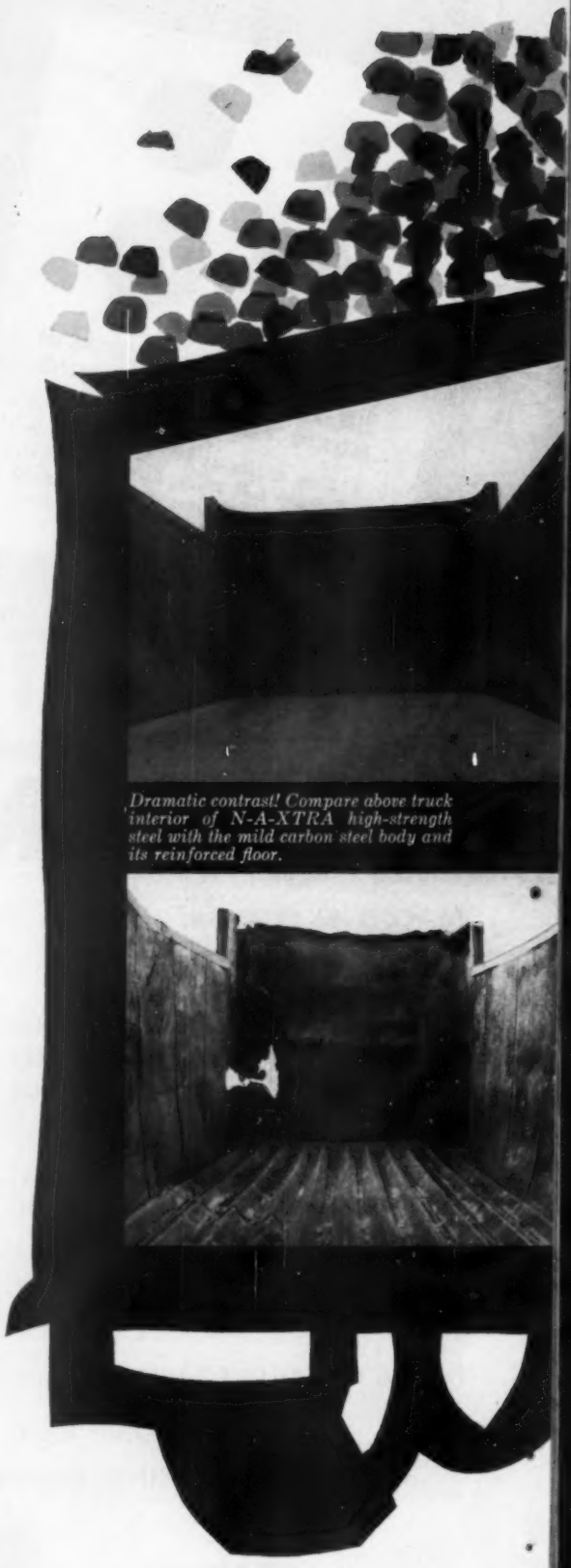
How long can a truck body take such a beating?

Until the company (which designs its own trucks) discovered N-A-XTRA high-strength steel, they used ordinary carbon steel, good for about 18 months' service. Though the truck bodies were as strong as they could be and still carry an adequate payload, maintenance was almost continuous—with breaks, dents, dings and sags occurring almost from the start.

Then they fabricated eight bodies out of N-A-XTRA, which has a minimum yield strength nearly three times greater than mild carbon steel. These trucks carry the same payload and after 18 months' service still look almost new. Owners estimate a life of five years, more than triple the others—with far less maintenance. The extra strength of N-A-XTRA also permits a strong floor that needs no expensive reinforcement to support the load against hydraulic lift action.

Eventually, all forty Edward C. Levy trucks will be made of N-A-XTRA high-strength steel. In fact, all patches and section replacements are now made with N-A-XTRA.

Tons of hot, abrasive slag may not be your problem—but the same steel that mastered these conditions is the one to remember when only the strongest steels will do. Rugged conditions, heavy loads and weight-saving construction are challenges that N-A-XTRA is designed to meet and beat. With excellent weldability, formability and toughness, these quenched and tempered N-A-XTRA steels are available in four levels of minimum yield strength, from 80,000 to 110,000 psi. They can also be supplied to higher levels of mechanical properties.



Dramatic contrast! Compare above truck interior of N-A-XTRA high-strength steel with the mild carbon steel body and its reinforced floor.

N-A-XTRA

A PRODUCT OF

GREAT LAKES STEEL

Detroit 29, Michigan

These two trucks have done the same tough work for 18 months. The only difference is that the one above is made of N-A-XTRA.

DESIGN NOTE:

Panels and floors for these trucks, designed by Edward C. Levy Slag Co., were fabricated of N-A-XTRA 100 (100,000 PSI minimum yield strength) from plates 3/16"-1/2" thick. Standard flame cutting procedures were used. Side frames were cold-formed of N-A-XTRA 100 from 3/16" plate, using both skip (6" weld, 6" skip) and continuous welds. Performance to date has been equal, indicating additional savings through skip welding.

For full technical information on N-A-XTRA high-strength steels, write Great Lakes Steel Corporation, Detroit 29, Michigan, Dept. 1-9.

***Great Lakes Steel is a Division of* NATIONAL STEEL CORPORATION**

FROM CREATIVE CRUCIBLE: HIGH SPEED STEELS THAT MAKE BETTER TOOLS POSSIBLE

CHECKING THE INVOLUTE PROFILE OF A SPLINE BROACH. Broach's 6" pitch diameter is designed to cut 48 splines—hold accuracy of +.0002"-.000" on all splines for 30". This accuracy is possible on broaches up to 82" when made of Rex High Speed Steel.

CIRCLE 209 READER SERVICE CARD

NOW, BROACHES PRODUCE MORE PIECES FASTER

They're also producing pieces with finer finishes and greater accuracy – because they're made of continually-improved Rex® High Speed Steels.

New broach designs and new broaching machines now enable you to mass-produce complex shapes in a matter of minutes. Furthermore, every piece is finely finished to within micro-inch tolerances.

What is behind this development? It's the increased skill of the broach tool makers, combined with Crucible's progress in making better high speed steels.

To produce the fine steels needed for broaches, Crucible tool steel specialists make use of the most advanced electronic instrumentation available today. For example: they use precision instruments to control the temperature of the molten metal in the melting furnace. So, each heat is produced under identical conditions.

CHECKING THE TOOTH SPACING OF HELICAL INVOLUTE SPLINE. Finishing teeth on broaches made of Rex High Speed Steels reproduce shapes within tolerances of a few ten-thousandths of an inch.

Crucible tool steel specialists employ new techniques that greatly improve deoxidation of the liquid steel. They also use new ingot mold designs that provide freedom from segregation when the steel solidifies. And they ultrasonically inspect every billet of Rex High Speed Steel before rolling or forging.

Today Rex High Speed Steels continue to make the best broaches because they offer *1.* more uniform distribution of carbides throughout the section. This ensures minimum size change, greater predictability in heat treatment, greater hardenability and more uniform hardness in the heat-treated tool. And *2.* more uniform distribution of sulfides in the free-machining grades—which provides improved machinability and superior surface finish.

To make precision tools better with Crucible's Rex High Speed Steels, call or write the nearest Crucible branch office or warehouse.

BETTER TOOLS, THROUGH BETTER STEELS. The constant improvement of Rex High Speed Steels ensures the increasingly better performance of hobs, taps, twist drills and cutters—as well as broaches.

CRUCIBLE STEEL COMPANY OF AMERICA

Branch Offices and Warehouses: Atlanta • Baltimore • Boston • Buffalo • Caldwell, N. J. • Charlotte Chicago • Cincinnati • Cleveland • Columbus • Dallas • Dayton • Denver • Detroit • Erie, Pa. • Grand Rapids • Houston • Indianapolis • Los Angeles Miami • Milwaukee • Minneapolis • New Haven • New York • Philadelphia • Pittsburgh • Portland, Ore. • Providence • Rockford • Salt Lake City San Francisco • Seattle • Springfield, Mass. • St. Louis • E. Syracuse • Tampa • Toledo • Tulsa

CIRCLE 210 READER SERVICE CARD

Dean Strand solved an unusually

Dean Strand's many years as an Abrasive Specialist and a salesman for machinery that uses grinding wheels have covered most of the problems in the book. That's why he so often finds practical solutions that are *not* in the book.

PROBLEM—An unusual grinding problem faced Illinois Tool Works, Chicago, when they began manufacturing a special steel gear shaper cutter. They required a grinding wheel that would generate an involute curve on the sides of the gear shaper cutter teeth, grinding with the side instead of the periphery of the wheel.

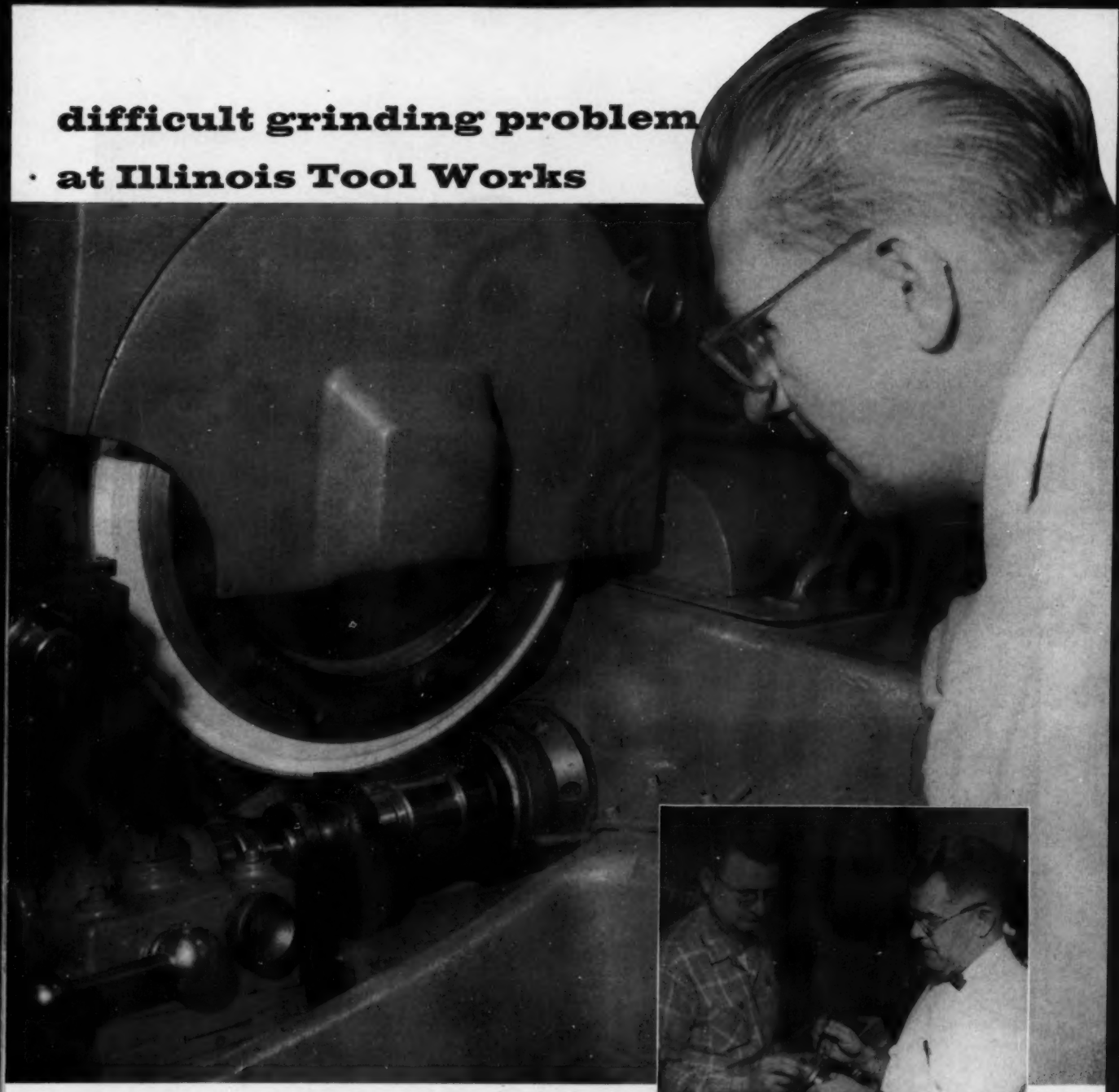
In attempting this grinding operation with competitive wheels, production was delayed by the wheels breaking down, glazing or mutilating the gear-teeth walls. It was impossible to maintain the involute shape of the teeth within specified accuracies.

SOLUTION—Bay State Abrasive Specialist Dean Strand was called in and went over every detail of the operation. He recommended a 16" diameter x 5/8" thick wheel with a highly friable aluminum oxide abrasive and a special Bay State vitrified bond modification, on Illinois Tool's gear-shaper-cutter grinding machine.

RESULT—No further problems on this gear finishing application! The wheel consistently maintains accuracies to within 1/10,000-inch and, in the words of Illinois Tool's Process Engineer Ed Leighton, "we wanted a wheel that would grind without glazing, that would stand up under these unique conditions, that would give us reasonable wheel life and would enable us to get real *production* out of our machine. Well, thanks to Dean Strand, we've got it."

Like Dean Strand, the Bay State Abrasive Engineer in your area is a trained expert. He backs up the work of the experienced men who represent Bay State's topflight distributors; and Bay State's research labs back them both with new ideas, techniques and materials. *Better grinding at lower cost . . . that is our business.*

difficult grinding problem · at Illinois Tool Works



(*Above*) Operator Dale Jackson at his gear-shaper cutter-grinder equipped with a Bay State 16 x 5/8-inch aluminum oxide abrasive wheel. Grinding is done by side of wheel instead of face. 1/10,000" accuracy is consistently maintained.

(*Right*) Process Engineer Ed Leighton and Inspector Leroy Wegner, of Illinois Tool Works, checking the tooth angle on a gear-shaper cutter. Extreme accuracy of the helical lead, and its involute shape, are vital to the completed product.

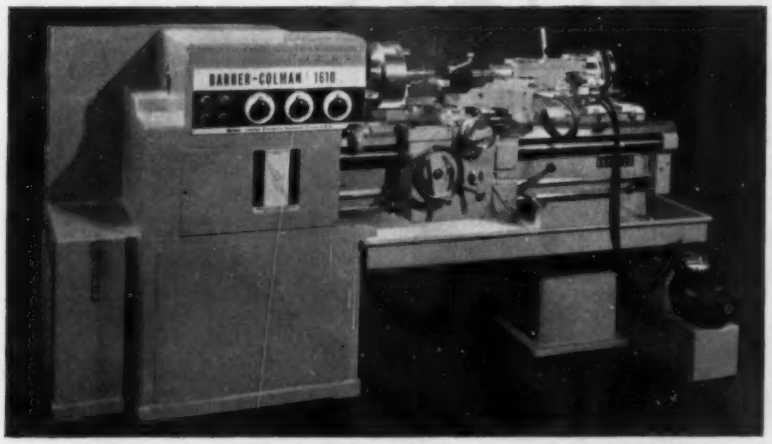
BAY STATE ABRASIVES

BAY STATE
WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

A New Concept in Lathes

New Barber-Colman "specialist" lathe features 16" and 20" swing and infinitely variable feeds and speeds



MODERN MACHINE TOOLS
MMT-PE
PRODUCTION EFFICIENCY

See the 1610 with tracer at 1960 Machine Tool Exposition . . . Booth No. 923.

Barber-Colman's new 1610 lathe with 16″ or 20″ swing and 6½ hp motor is a "specialist" lathe for turning, facing, and boring—and there's a place for it in every lathe department. Setup time is reduced, and production is increased 100% or more on many jobs. You might hesitate, at first, before buying a precision lathe that cannot be used for threading. But greater speed and feed control for those who want productivity and precision at a saving produces several practical benefits.

Low initial cost—You can purchase a Barber-Colman 1610 (*equipped with tracer attachment*) for approximately the same price as a toolroom lathe of the same rated capacity and quality. If other lathes are available for threading, this lathe is the most economical one to use for high-speed turning, facing, and boring. This lathe is also available as a 1610-13 for high-speed machining of parts which require 20″ swing over the ways.

Why put low-speed work on a high-speed lathe?

Since threading normally requires slow speeds, older toolroom lathes can be used economically for cutting threads. Put your turning, facing, and boring operations on this lathe to take full advantage of its high speeds (up to 2000 rpm) and infinitely variable feeds and speeds.

Control of feeds and speeds—Spindle speed of this 1610 is instantly, independently, and infinitely variable to any speed in its available range. Even during the cut, the operator can change spindle speeds just by turning a dial on the headstock. No time is lost shifting gears or stopping the machine.

Power feed to both carriage and cross slide is infinitely variable, also. There are no gears to shift—just a simple dial on the headstock. Feed per revolution can be varied from .0001″ to .488″, depending upon the speed range of the machine.

On high stock removal jobs, you can rough to within a few thousandths of final size, then take a quick finishing cut. The ease with which Class B operators can control feeds and speeds assures finer, more uniform finish, maximum machine utilization, and economical tool life on every job.

Simple tracer setups—Experience proves that less than 20 minutes is needed to set up the Barber-Colman hydraulic tracer. This is possible because the stylus can be positioned independently of the tool slide—the valve responds to pressure from any direction. Front mounting makes it easy to change over—chips don't pile up on the template. The lathe can be operated manually without removing the tracer, or the attachment can be replaced with the regular compound in less than ten minutes. Tracer operates from 0° to 90° with the work axis, and controls the machine consistently within .001″ on diameter or length.

Quality, versatility and economy

Convenient controls—particularly the five-position, turret-type longitudinal feed stop—simplify operation even at peak production efficiency. This feed stop is particularly advantageous for multiple-diameter turning because it eliminates scale readings and reduces skill requirements. It is one of many standard features on the 1610—simple, easy to use, and trouble-free.

Obviously, this is another Barber-Colman quality machine that will turn out toolroom quality work. Phone your Barber-Colman representative or write us for descriptive literature and complete specifications. Ask for Bulletin No. 9061-1.

Barber-Colman Company

BARBER COLMAN

51 Loomis Street, Rockford, Illinois

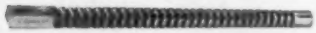
INSTANT KEYWAYS

for a penny apiece

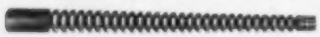
With Minute Man Keyway Broach Kits you can cut keyways in one minute for as little as one cent. For keyways from 1/8" to 1" in any bore from 1/4" to 3".

SAVE TIME WITH THESE OTHER STANDARD STOCK BROACHES

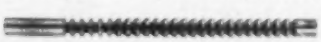
Minute Man®



SQUARE BROACHES
For finishing 1/8" to 3/4" square holes in one pass in cast or drilled bore.



HEXAGON BROACHES
For finishing 1/8" to 3/4" hexagonal holes in one pass in cast or drilled bore.



ROUND BROACHES
For finishing 1/4" to 1" round holes in one pass in drilled bore.

SEND FOR CATALOG AND PRICE LIST

The duMont Corp., Greenfield, Mass.

MAIL FREE BROACH CATALOG AND PRICE LIST A describing Square Broaches, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name.....

Company.....

Address.....

duMont

LETTERS

to the editors

330 W 42nd St, New York 36, NY

Test Your Writing

Dear Sirs:
Orchids to Associate Editor Tom Johnson for his splendid article, "Three ways to test your writing" (*AM/MM*—Mar 7 '60, p112). It is an impassioned plea, and we are happy to see industry waking up to one of its biggest wastes.

We would be even happier, though, if Editor Johnson had aimed one of his blows at long sentences. Our overall enthusiasm for his article was dampened slightly by his statement that short sentences ". . . may be easier to *read*, but not necessarily easier to *understand*."

That just ain't true. Neither, we think, is his assertion that ". . . the sentence often must be long to make good sense."

Still, we think Editor Johnson deserves a pat on the back. Especially since he writes with sentences that are beautifully short.

Albert M Joseph, *supervisor*
Technical Writing,
Butrick and Associates
Cleveland, Ohio

We asked Tom if he had any further comments on long sentences vs short ones. He did:

Mr Joseph's point is well taken, for long sentences often are a feature of poor writing. But is the writing bad because the sentences are long? Not usually, it seems to me.

Too many books on writing over-emphasize, in my opinion, sentence length. "Keep your sentences short," they hint, "and you'll solve most of your problems." Such advice will produce writing that is more readable (definition: easy or interesting to read).

But business reports are written primarily to inform, not to be readable. An informative report is likely to be readable, but a readable report isn't always informative. Other factors—use of active verbs, concrete nouns, and sentence variety—are more important to informing than sentence length. A long sentence can be just as informative as a short one; if it's well constructed, it should be just as readable.

Wrong Formula

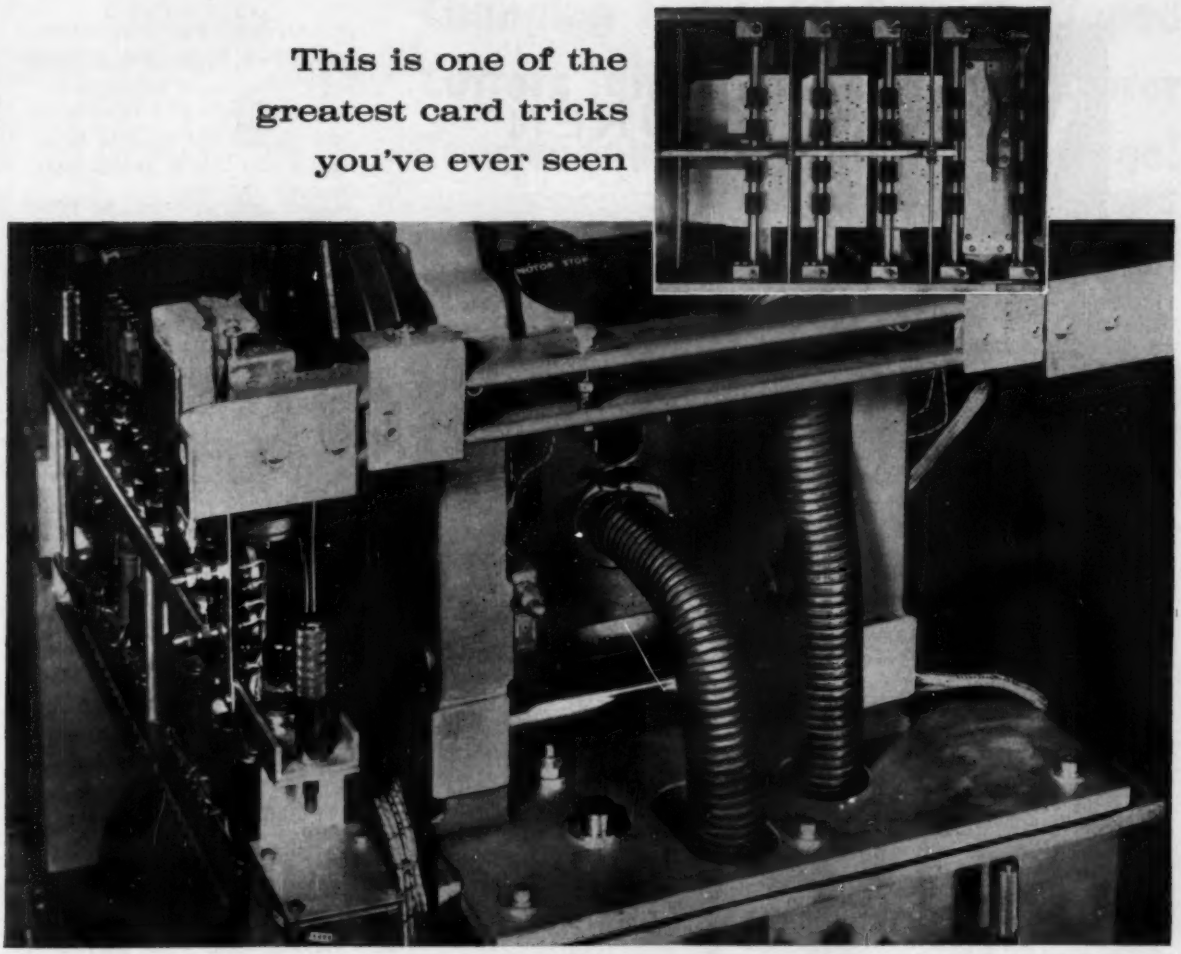
Dear Sirs:
We would like to refer to the Practical Idea entitled, "Calipers Measure Beyond Normal Capaci-

SHOPMATES

N. Jarvis

— AND WHEN THE WHIP AIN'T HERE, YOU GOTTA WORK LIKE SIXTY SO'S YOU'LL MAKE A GOOD SHOWIN' — HE LIKES THAT — !
DON'T YOU BELIEVE IT!!! NO MATTER HOW MUCH YOU DO WHEN HE AIN'T HERE — HE'LL EXPECT TWICE AS MUCH WHEN HE IS HERE — HE DON'T TRUST NOBODY !!
NEW MAN ?
YEAH ! THE WHIP'S NEPHEW !
N. JARVIS

This is one of the greatest card tricks you've ever seen



This is how Flexible Tubing helps Univac* designers bring it off

In the Remington Rand Univac, Solid-State Computer, the high-speed reader reads 450 punched cards *twice* every minute, and compares the two readings on every card.

Cards must be positioned exactly right in the feeder — and held there! Strong suction does the trick . . . strong suction provided through two lengths of Flexible Tubing Corporation's noncollapsing "Flexflyte." A third length gives the high speed reader a rugged, vibration-free connection between the suction turbine and the distribution manifold. The great flexibility and toughness of "Flexflyte" permits it to stand up under the constant movement of the picker knife.

Chances are you don't design high-speed computers. But if you work on any kind of original equipment where the handling of air, liquids or light solids is a design problem, there's a Flexible Tubing product that can do the job! You can choose fabrics, coatings, diameters and sizes to fit your specifications. Flexible Tubing is now being used on a wide range of original equipment — diesel engines, farm combines, industrial gluing machines, television transmitters, vacuum cleaners and many other products.

**Univac is a registered trade-mark of the Sperry Rand Corporation*

Flexible Tubing
CORPORATION
Guilford, Connecticut

Flexible Tubing Corp., 25 New Whitfield St., Guilford, Conn.

Gentlemen:

I'm designing a new product ☐ I'm redesigning an old one ☐ One of my problems is the handling of air ☐ liquids ☐ light solids ☐ Could be Flexible Tubing can help me solve them. I'll give you 10 minutes to show me, to prove it. Phone for appointment ☐ No problems right now. Send me literature for my files ☐

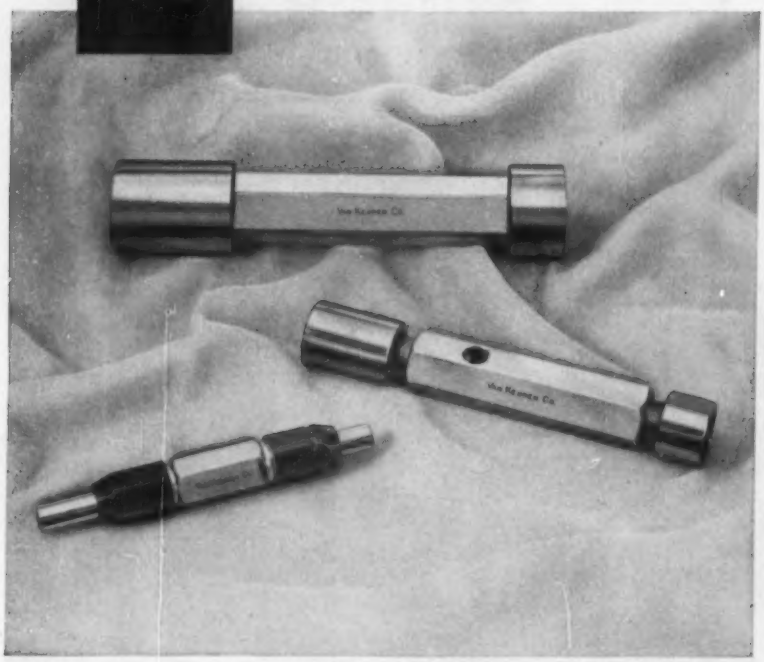
NAME .....

COMPANY .....

ADDRESS .....

CITY ..... STATE .....

VK VAN KEUREN



For those who require precise measurements

VK

THE Van Keuren CO.
Since 1920
173 Waltham Street, Watertown 72, Mass.
PRECISION MEASURING TOOLS
. . . rated the world's most accurate
Plug Gages · Measuring Wires · Optical Flats and Light Wave Equipment · Gage Blocks · Precision Lapping Service and Parts

ty" (*AM/MM*—Feb 8 '60, p152). The formula to be used appears as follows:

$$R = \frac{a^2b^2}{2b}$$

We believe this formula is erroneous and that it should have appeared this way:

$$R = \frac{a^2 + b^2}{2b}$$

J L Pegler, *chief design engineer*
Davis Engineering Division
Tube Reducing Corp
Wallington, NJ

Dear Sirs:
. . . This must be an error in printing.

Ernest Jelinek
The Donley Brothers Co
Cleveland, Ohio

Dear Sirs:
I would like to call your attention to an error . . .

William Tobias
Rochester, NY

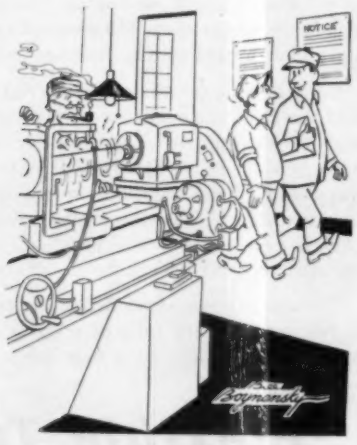
Yes, it was an error in printing, and we appreciate the interest of our sharp-eyed readers who have called it to our attention. The formula is stated correctly by Reader Pegler above—Ed.

Laminating Epoxy

Dear Sirs:
I would like to know the supplier of Epoxide 207, which was mentioned on your "Materials" page (*AM/MM*—Mar 7 '60, p81).

James H Garrison
South Plainfield, NJ

For further information write Mr J V Keneally, asst advertising mgr, Union Carbide Chemicals Co, 30 East 42nd St, New York, NY—Ed.



"The company had to take him out of retirement, he was the only worker that can make a set-up on that old lathe!"

CALENDAR

Instrument Society of America —Instrument-Automation Conference and Exhibit, May 9-12, Civic Auditorium and Brooks Hall, San Francisco, Calif.

American Society for Metals Southwestern Metal Exposition and Congress, May 9-13, State Fair Park, Dallas, Texas.

American Foundrymen's Society —Castings Congress and Exposition, May 9-13, Convention Hall, Philadelphia, Penna.

Machinery Dealers National Association—Annual Convention, May 11-14, Edgewater Beach Hotel, Chicago, Ill.

American Institute of Industrial Engineers — National Conference and Convention, May 12-14, Sheraton-Dallas Hotel, Dallas, Texas.

American Society of Mechanical Engineers — Production Engineering Conference, May 17-19, Hotel Schroeder, Milwaukee, Wis.

National Institute for Disaster Mobilization — Industrial Mutual Aid Conference, May 18-20, Netherland-Hilton Hotel, Cincinnati, Ohio.

Design Engineering Show, May 23-26, New York Coliseum, New York, NY.

American Supply & Machinery Manufacturers Association — Triple Industrial Supply Convention, May 23-25, Conrad Hilton Hotel, Chicago, Ill.

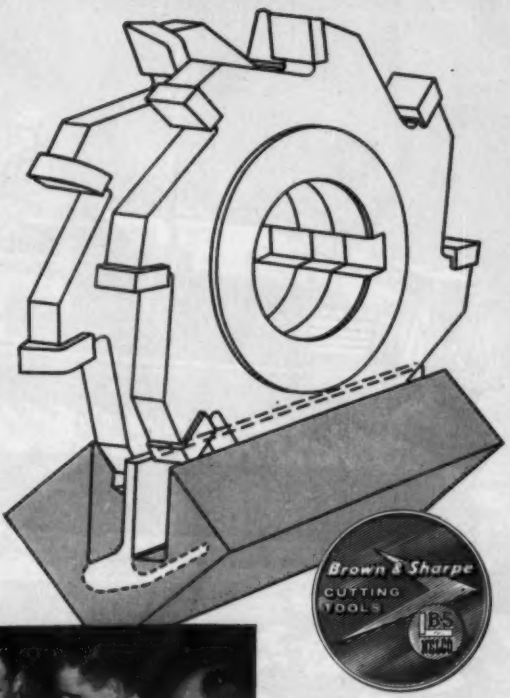
American Society for Quality Control — Annual Convention, May 24-26, Sheraton Palace Hotel, San Francisco, Calif.

American Society of Mechanical Engineers — Summer Annual Meeting & Aviation Conference, June 5-9, Statler Hilton Hotel, Dallas, Texas.

Society of Automotive Engineers —Summer Meeting, June 5-10, Edgewater Beach Hotel, Chicago, Ill.

Material Handling Institute—New England Show, June 6-8, Commonwealth Armory, Boston, Mass.

Changing to NELCO Carbide Tipped Cutters gives Hinge Manufacturer Tremendous Competitive Advantage!



Drawing shows one milling operation that eliminated 5 others and completed cuts 6 times faster than cutters previously used.

Brown & Sharpe Cutting Tool Engineer demonstrates faster milling speeds and improved surface finish on aircraft hinge using Nelco Cutters in gang.

A Brown & Sharpe Cutting Tool Engineer, with the approval of management in a plant making aircraft hinges, assisted in effecting substantial production savings and improved quality on dozens of production milling projects.

Nelco Carbide Tipped Cutters now mill a 72" bronze hinge piece, in one pass, at 12 to 15 inches per minute feed and produce a superior finish. Formerly, a feed of 1 inch per minute was maximum. Time for another milling operation was reduced from one hour to 2½ minutes.

Tremendous production benefits can result from B&S Tooling Service.

A B&S Cutting Tool Engineer in your shop can show you how . . . and he will, if requested, hold a training course for machine operators in your shop.

There's no obligation. It's all part of the new B&S COMPLETE TOOLING SERVICE. Call your local B&S Distributor today.

Send for the B&S-NELCO "Condensalog."

For that EXTRA Edge in Production

NELCO

NELCO Tool Co., Inc.
Subsidiary of:
Cutting Tool Division
Brown & Sharpe Mfg. Co.,
Providence 1, Rhode Island

MORSE TOOLS HELP BUILD CHARACTER FOR EIMCO

...Morse tough tools cut smooth, fast holes...help speed production of mining machines with guts.

For rough, rugged power, you can't beat Eimco mining machines. They move rock and ore . . . carry them up steep grades quickly and easily.

It takes tough tools to make these rugged machines. It takes Morse Cutting Tools . . . the toughest on the market. They cut smoother, faster – and last longer.

Let Morse help you make your tough jobs easy. Call your Morse-Franchised Distributor today. He'll give you the story.

MORSE

means "THE MOST" *in Cutting Tools*

MORSE TWIST DRILL & MACHINE CO., NEW BEDFORD, MASSACHUSETTS

Warehouses in: NEW YORK • CHICAGO • DETROIT • DALLAS • SAN FRANCISCO

Morse means more production . . . smoother, more accurate production . . . with every type of cutting tool from drills, reamers, taps and dies, to end mills, milling cutters, slitting saws and "specials". So, if you want the best from every cutting tool you buy, mark your order "MORSE". For if you want *Morse Quality*, there's only one way to get it . . . *specify Morse.*

VN

A Division of VAN NORMAN INDUSTRIES, INC.

CIRCLE 219 READER SERVICE CARD

8297

HARDINGE STOCKS COLLETS . . . .

. . . . . AT ELMIRA, N. Y.

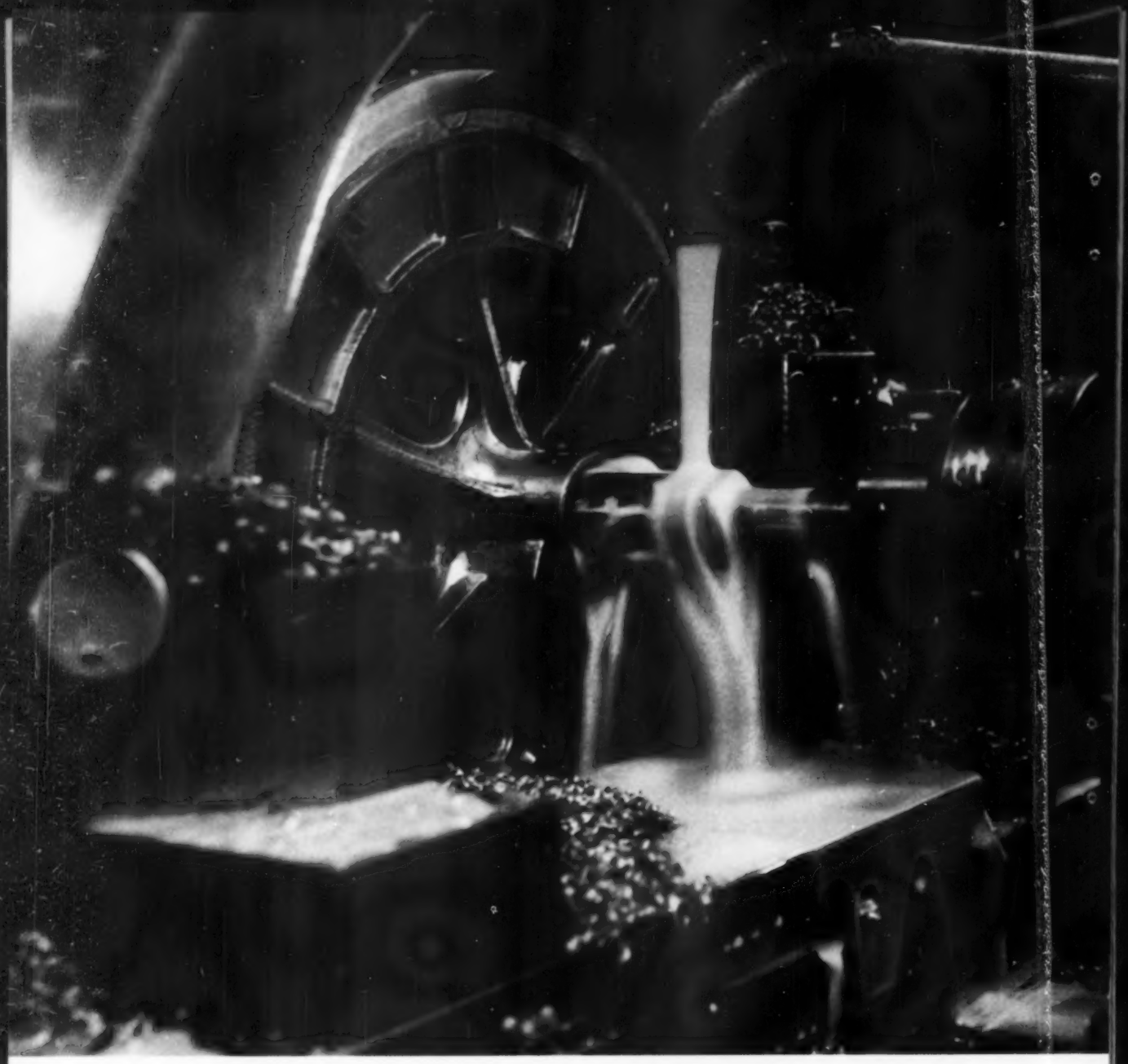
AND **COLLETS** AT ATLANTA, GEORGIA
AND **COLLETS** AT BOSTON, MASS.
AND **COLLETS** AT CHICAGO, ILLINOIS
AND **COLLETS** AT DAYTON, OHIO
AND **COLLETS** AT DETROIT, MICH.
AND **COLLETS** AT HARTFORD, CONN.
AND **COLLETS** AT LOS ANGELES, CALIF.
AND **COLLETS** AT NEW YORK CITY
AND **COLLETS** AT PHILADELPHIA, PA.
AND **COLLETS** AT OAKLAND, CALIF.
AND **COLLETS** AT MINNEAPOLIS, MINN.
AND **COLLETS** AT ST. LOUIS, MO.
AND **COLLETS** AT SPRINGFIELD, N. J.
AND **COLLETS** AT ROCHESTER, N. Y.
AND **COLLETS** AT PORTLAND, OREGON
AND **COLLETS** AT SEATTLE, WASH.
AND **COLLETS** AT TORONTO, CANADA
ALSO **FEED FINGERS and PADS**

IN THESE LOCATIONS FOR IMMEDIATE DELIVERY

HARDINGE BROTHERS, INC., ELMIRA, N. Y. U.S.A.

CIRCLE 220 READER SERVICE CARD

CIRCLE 221 READER SERVICE CARD ►



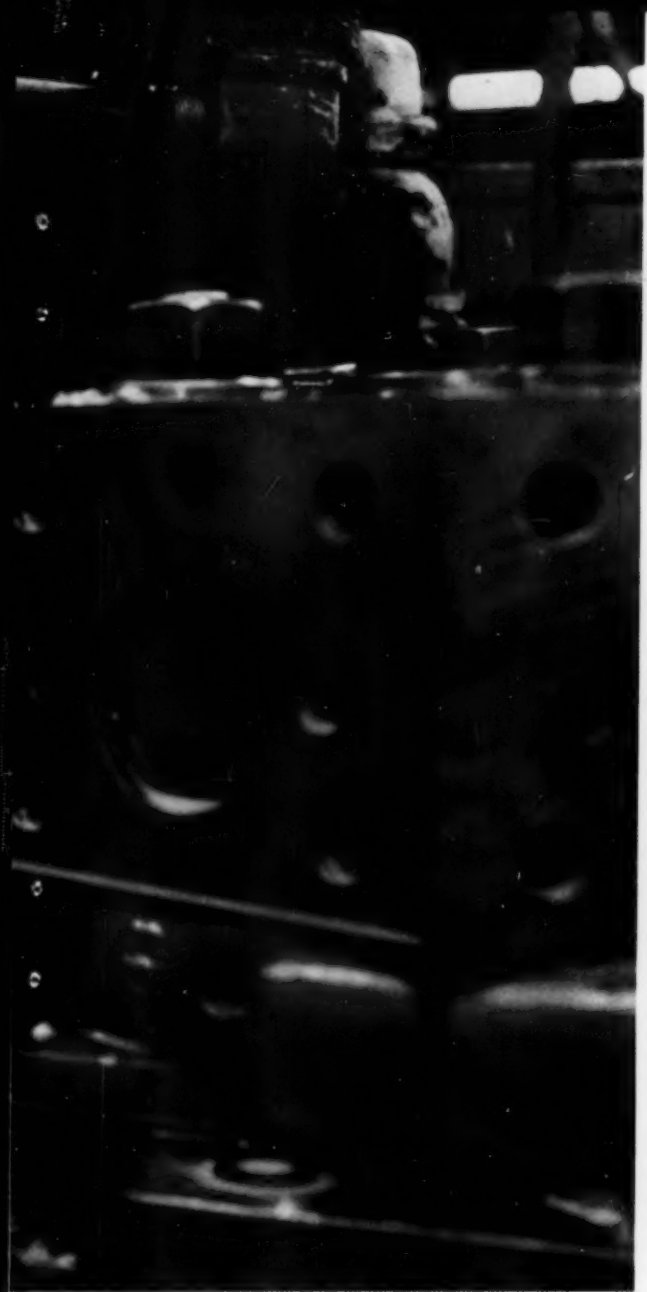
Extends tool life, maintains precision with Gulfcut® oils...

GULF MAKES THINGS

At its factory in Grand Rapids, Michigan, Automatic Music, Inc., operates over 400 machine tools to turn out the hundreds of small precision parts that are required for their famous coin-operated record players. More than 30 types of alloys, brasses, carbon steels and other metals are machined, many to tolerances of .0001".

One critical "juke box" component is the aluminum selector wheel, made to hold 200 pins, or one for each musical selection offered. Wheels are chamfered, bored, reamed, grooved, turned and burred in two minutes. At 208 rpm, using carbide-tipped tools, considerable heat would be generated, so Automatic Music uses Gulfcut Soluble Oil in a 1:50 emulsion. The machine operator reports long tool life, and what's more—"It's easy on the hands."

Another part requiring particular precision is the coin-control pin that rejects slugs while accepting nickels, dimes and quarters. Seven operations are involved in machining these pins on two turret lathes. For this, Automatic Music uses Gulfcut 41C, a sulfo-chlorinated-lard cutting oil that gives good finish, accurate tolerances and long tool life. On the average, the high speed tool needs



Gulfcut 41C helps insure fine surface finishes and contributes to accuracy. Machinist Harry Ames grinds the high-speed tool once per shift on the average.

Automatic Music's Machine Repair Supervisor, Dan Van Heteren (right), shows small precision component to Richard Shumacker, Gulf Sales Engineer.

Aluminum selector wheel for Automatic Music "juke box" is completely chamfered, bored, reamed, grooved, turned and burred in two minutes. Gulfcut Soluble Oil in a 1:50 emulsion carries heat away from the carbide-tipped tool edge.

RUN BETTER!

GULF

to be ground only once a shift. Altogether, the firm uses Gulfcut 41C in fourteen turret lathes, all screw machines and more than a hundred drill presses.

Perhaps *your* machining operations can be improved by the use of Gulfcut oils. To find out, just call your Gulf office. Meanwhile, write for your free copy of the new 116-page handbook "Metal Machining with Cutting Fluids."

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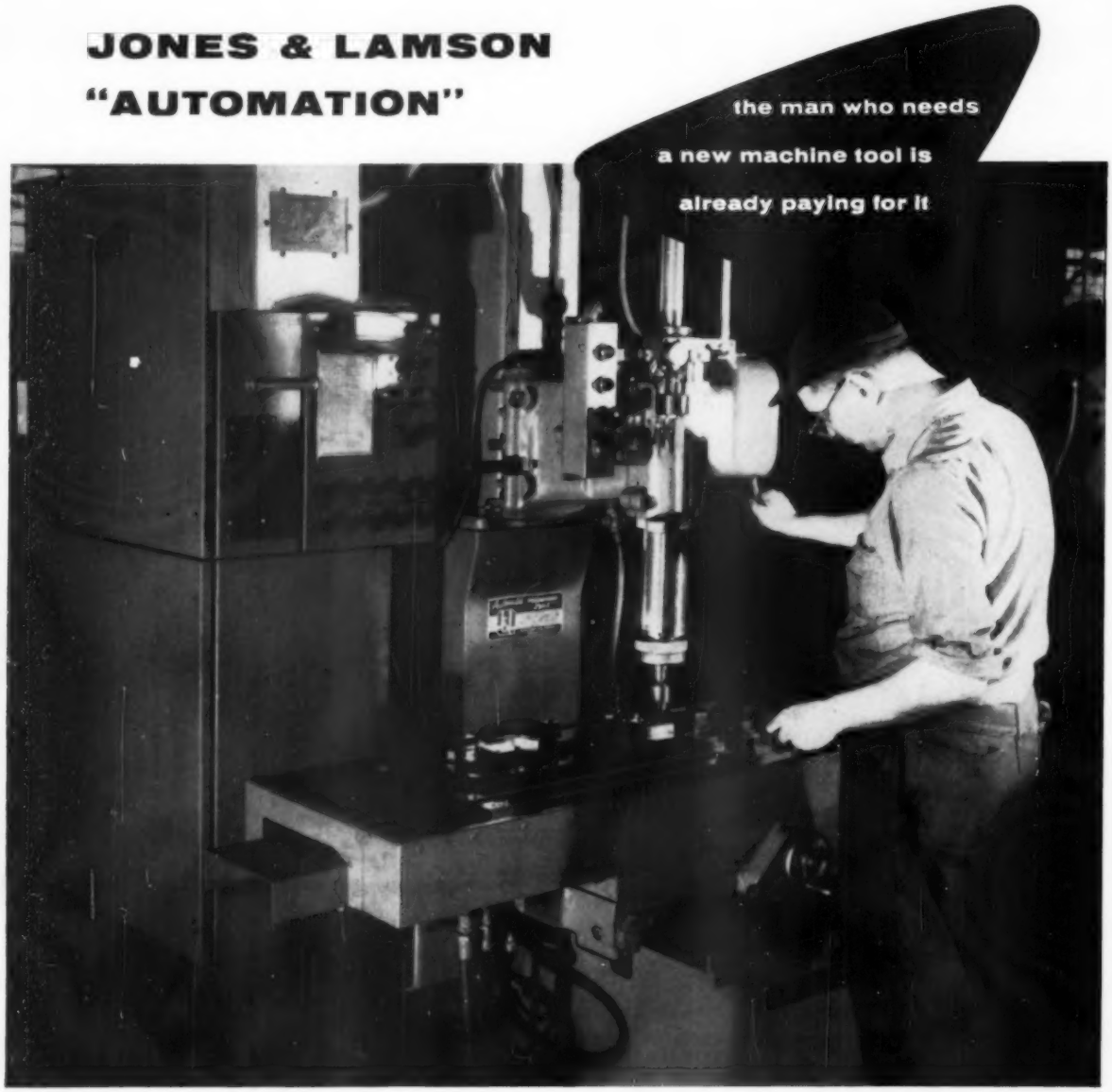
JONES & LAMSON "AUTOMATION"



Major savings on every job during first full year of tape control operation

At The Goss Company, a division of Miehle-Goss-Dexter, Inc., Chicago, tape control machining plays an important part in the over-all production operation.

For instance, this J & L tape-controlled positioning table, equipped with a standard column drill press, has achieved an average of 30 to 40% savings in floor-to-floor time on every job assigned. One job, involving drilling and reaming of small malleable iron transfer roll adjusting plates, was transferred from a conventional sensitive drill press setup to the J & L machine. Job lots consisted of only four pieces.

The old setup required 3.1 hours production time for each lot. Using tape control, with a simple locating and clamping setup, Goss has been able to cut this time to 1.7 hours—a saving of 1.4 hours per lot, or more than 45%. Hole location is more accurate too, because J & L tape control consistently holds tolerances of + or — .001". With the old setup, it was difficult to hold hole locations to less than .010" on layout jobs of this size.

Investigate how *production-proven* tape control units can help increase the efficiency of *your* operation. Write to Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont for folder 5902, "Tape Control Positioning".

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

◀ CIRCLE 222 READER SERVICE CARD

CIRCLE 223 READER SERVICE CARD

SPOT NEWS...

- **High-tensile carbon-steel wire** with a guaranteed tensile strength of 575,000 psi is in pilot production at National Standard Co, Niles, Mich. Now being made only in the 0.004-in.-dia size, wire will eventually be made in other sizes and will soon be available in commercial quantities.

- **A continuous-production vacuum furnace** has been designed by the National Bureau of Standards for evacuating and sealing ceramic-wafer electron tubes. Tube assembly is introduced into the vacuum chamber and heated to about 1000 C (1832 F). The combination of heat and vacuum degasses the tube, and the heat brazes together the metallized surfaces of the ceramic wafers.

- **Latest word on Ford's "compact compact"** (*AM/MM*—Mar 7 '60, p75) is that the engine will slide out of the car body on rails, making it easier to service. This is obviously a challenge to VW and Renault, which now boast about ease of servicing. Car should be ready in the fall and sell for under $1700.

- **Micro 99, a special grade steel,** with custom heat treatment, is reported to equal carbide in wear resistance, surpass it in elasticity, and have the toughness of tool steels. Material was introduced by Micromatic Hone at the ASTME Tool Show. For an on-the-spot report of the show see page 95.

- **Turret lathe of new design** with manually preset electronic programming of all functions was introduced by Sheldon Machine Company, Inc, Chicago, at Tool Show. Lathe is priced to compete with automatically programmed machines offered by foreign manufacturers.

- **A new series of electro-erosion machines** will be made in Great Britain by GKN-Welsh Metal Industries companies in the near future. In common with the most recent developments in such machines, the accent will be on higher metal removal rates.

- **Soviets are planning a greatly expanded program** for industrial use of radioactive isotopes. Same report from Moscow says that in 1958 alone, use of radioisotopes saved Russian industry about two billion rubles, and that for the current seven-year period the savings in the engineering and metalworking industries should amount to four to five billion rubles ($1-$1.25 billion at the official rate).

- **Bendix Aviation Corporation,** Detroit, has been named sole U S distributor and service representative for numerical control systems manufactured by Ferranti, Ltd, of Great Britain.

- **Chemical fuel cells** which produce electricity directly from the chemical reaction of hydrogen and oxygen are being evaluated by General Electric. Units, ten of which have been ordered by the armed forces, are rated at 100 watts for 14 hours. Ionics, Inc, Cambridge, Mass, has also demonstrated a similar fuel cell, and Chrysler Corp is also working on them (page 79).

- **The Manufacturing Engineering Council,** a new professional society of manufacturing engineers, will be devoted exclusively to the interests and problems of manufacturing engineering, and will seek membership in the ranks of both engineering and management personnel engaged in this work. Further information available from Frederick Ellin, 3601 Howard St, Skokie, Illinois.

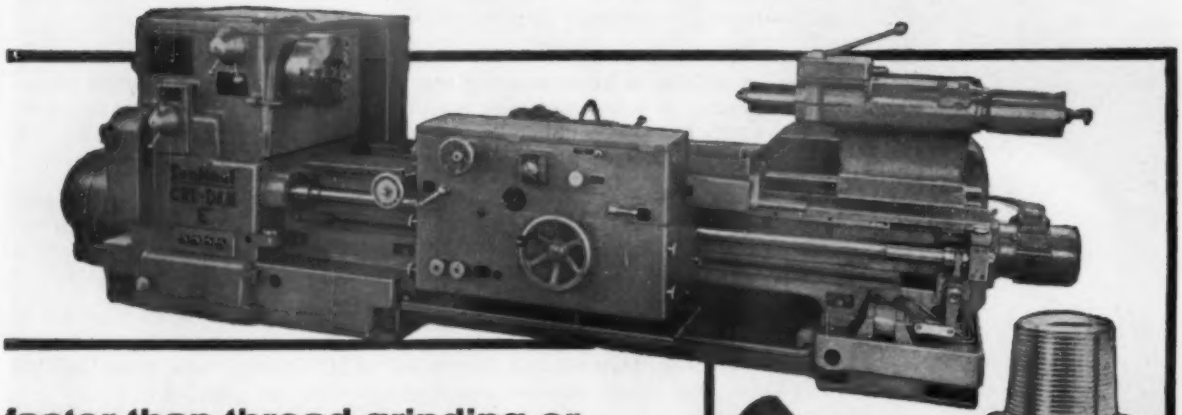
- **Another heat-resistant alloy** is to be added to the Nimonic series produced by Henry Wiggin & Co, Ltd, Birmingham, England. New material is reportedly suitable for working temperatures up to 1796 F.

- **Russia's recent boast that production** for the first quarter of 1960 was 11% higher than for the same period last year, and 4% higher than planned, was tempered somewhat by a later report that there many cases where failure to modernize and add new machines held productivity down.

CRI-DAN

(Semi-Automatic Single Point)

THREADING LATHES...



faster than thread grinding or milling...handles toughest jobs on hardest materials at less cost--

distributed by

GISHOLT

Widely used throughout Europe and rapidly gaining favor in the U.S.A., CRI-DAN High-Speed Threading Lathes offer outstanding advantages on a wide variety of threading work. Using single-point carbide tools and positive, cam-controlled movements, CRI-DAN provides very accurate lead and thread form on all types of internal and external threads, including multiple-start, coarse, fine, left- or right-hand, parallel or taper, with metric or inch pitches. Highest production, accuracy and fine finish are assured on even the most difficult materials.

With simple operation and 15 minute change-over, CRI-DAN is an extremely versatile machine capable of handling an amazing range of components at high production rates. Single-point carbide tools, easily resharpened or replaced, cut tooling costs to a minimum.

Two models are available with a full complement of accessories to meet your needs. Ask your Gisholt Representative for full details or write

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Investigate Gisholt's Extended Payment and Leasing Plans

Turret Lathes • Automatic Lathes • Balancers • Superfinishers
Threading Lathes

WASHINGTON...

Influence peddling by ex-Brass . . .

The long-simmering political fuss over alleged influence peddling on military contracts by retired brass on industry payrolls is coming to a climax. The House has passed a bill, the Senate will now take up the measure.

If and when a bill does go through Congress this session, it's obvious it will be a mild one, far from the measure Rep Hebert and others want.

The outlook is this: Even if a bill is approved, there will be little if any direct impact on contractors who hire former officers. So long as the ex-brass do not engage in clear-cut selling activities—something even present laws prohibit—contractors can continue to employ retired military men.

The House-passed bill requires former officers on defense industry payrolls to register formally with the Pentagon, bars them from "selling" to the military for two years after retirement, and requires contractors to list retired officers in their employ before receiving new military business.

Violation of the rules calls for court martial and withholding of retirement pay for the officer, suspension of contract payments to the company.

The registration provision is new; the two-year selling ban is fundamentally a clarification of the present vague statutes. Hebert and other lawmakers who've made this a hot issue want tough criminal penalties for violations and tighter restrictions on the employment of retired officers.

Defense contracts analysis . . .

The Pentagon has made a special analysis of prime contract awards to the 25 leading contractors in fiscal 1959. It shows that 40.9% of the contracts (in terms of dollar value) were awarded on a fixed-price basis and 58.6% were cost-reimbursement types.

The 25 leading firms accounted for $12.3-billion worth of military business, or 54.6% of the total value of defense contracts placed in fiscal 1959.

Over half the fixed-price contracts included incentive provisions—that is, the contractor's profit allowance was boosted or trimmed as production costs fell below or exceeded contract target prices. The next most common type of fixed-price contracts provided for a firm sum.

All but $800-million worth of the cost-reimbursement contracts included fixed fees—that is, the contractor was awarded a specific percentage of costs as "profit."

Only one per cent of contract awards to the 25 top companies were made on a formally advertised basis. On an overall basis—for all the $25-billion worth of contracts for goods and services placed in the year—13.6% of the dollar value was advertised; the remaining 86.4% was awarded through negotiated procurement.

Consolidated military buying . . .

The Pentagon is considering plans to step up efforts for consolidating the procurement of various types of hardware. Already, there are single military buyers for well over 50 commonly used items. Most recently, the Air Force's Gentile AFB, Ohio, was authorized to become single purchaser for electron tubes for all the services, the Navy Stores Office in Philadelphia for general industrial supplies.

Next item for which procurement will be consolidated: automotive supplies. The defense Dept is now spelling out the specific types of equipment and deciding which procurement agency should handle the chore.

At the same time, studies are being made on the advisability of consolidating the military's multi-billion-dollar procurement of electronic goods—end-items, components, spares, and replacement parts. A decision probably won't be reached till the end of the year. But GAO supports the move, even proposes that other aspects of supply management (in addition to procurement) be consolidated.

Pros and cons . . .

The argument for consolidated procurement is this: Costs could be cut, duplication of effort reduced, and delivery of equipment accelerated if one single military agency rather than dozens would do all the buying of a common-used item bought in large quantity. Some 40 military field offices buy electronic equipment of one type or another. Roughly $2-billion worth of procurement is involved in the items being studied by the Armed Forces Supply Support Center for possible consolidation.

But there are many military officials—notably in the Navy—who oppose efforts to unify buying. So do almost all contractors. The contractors see in consolidated procurement a threat to the volume of military sales. They fear that lumping vast amounts of purchase orders into smaller numbers of large-volume procurement transactions would squeeze out many old suppliers.

The Navy's opposition boils down to this: Requirements differ so much among services that consolidated buying is not feasible. The Navy worries about operational headaches if an agency "unresponsive or less sensitive" to the Navy's peculiar requirements were to be entrusted with buying Navy equipment.

BULLARD

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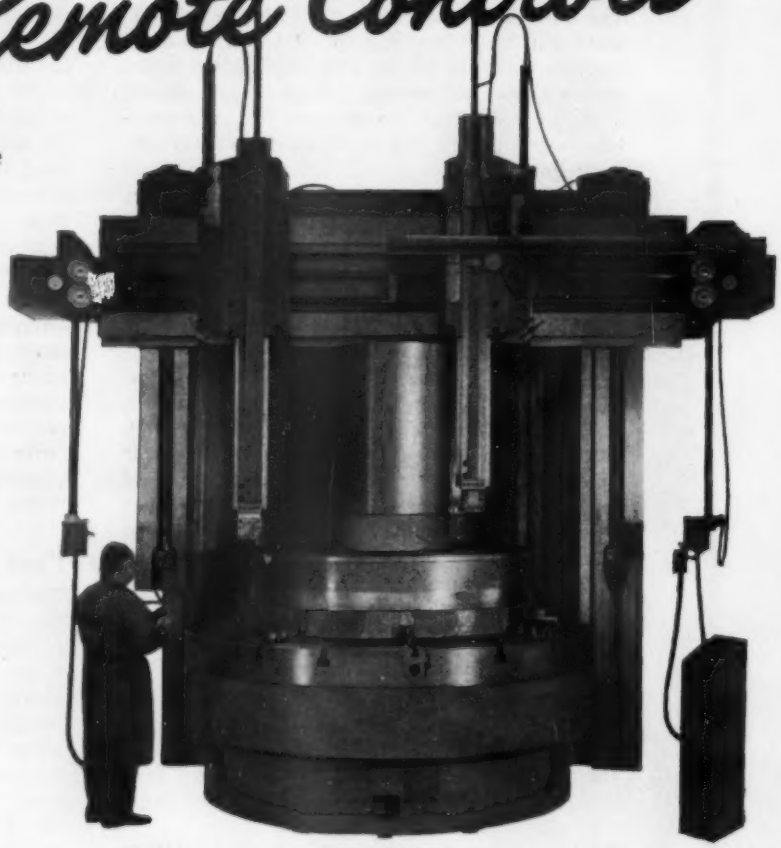
FEATURE *Simplified Remote Controls*

Within the span of a man's hand, utilizing a stationary and portable pendant, are all the controls necessary to actuate these modern giant mills. No climbing or clamoring for buttons or levers – every function of the machine is controlled from a position most advantageous to the operator.

The stationary pendant controls feed rate, table speed, starting and stopping of the table – also table jogging.

The portable pendant controls direction of heads in traverse or feed for either horizontal, vertical or 45° travel.



108" Dynatrol Vertical Boring and Turning Mill
Capacity – Maximum swing 120"; Height under rail – 80"; Ram travel – 60"; Table speed ranges, optional, Low 1.4 to 50; Int. 2.1 to 75; High 2.8 to 100; Feed rates infinitely variable from 0-500; available with Plain Table, or 4-jaw independent built in chuck.

This control system, and other revolutionary new Dynatrol features, enable the operator to utilize modern cutting tools at maximum speeds – cut to closer tolerances with superior finish – remove more metal per hour and keep the tool in the cut for more hours per shift. Table diameters of sizes 92, 108, 124 and 144 inches are available. Write or telephone for detailed catalog and complete information. The Bullard Company, Bridgeport 9, Conn., telephone Edison 6-2511.

* Trade Mark

. . . YOU CAN'T BEAT A BULLARD . . .

DETROIT...

The leader's cross...

A dissident Chrysler stockholder named Sol Dann hurled charges of nepotism, favoritism and mismanagement at the company's board of directors during an unusually stormy annual meeting here recently. Dann, a Detroit attorney who normally specializes in workman's compensation cases, differs from the usual type of heckler in that he owns 5100 shares of stock.

Dann, in his 45-minute talkathon, said "We have requested the directors to pursue action for damages against certain steel suppliers, parts vendors, salvage operators and many other persons and corporations doing business with Chrysler Corp." Dann said that Chrysler had paid up to $300 a ton for steel during the recent shortages. Chrysler spokesmen later denied this.

President L L Colbert managed to break in long enough to hotly deny any improper action on the part of himself, and—"to his knowledge"—his officers. Older observers present remembered that the association of National Automotive Fibers with Chrysler dated from the Keller Regime, and was terminated as an exclusive shortly after Colbert took office.

In a prepared statement, Colbert predicted that the corporation would be solidly in the black for the first quarter, but warned that "profits are being squeezed by the growing market for low-priced and compact cars." Colbert also revealed officially that the company would market another compact car through its Dodge Division (*AM/MM*—Mar 7 '60, p75) starting with its 1961 models.

Fuel from the sky...

Though not for the immediate future, research on fuel cells is a priority project with major U S automakers. Chrysler's Dr C R Lewis notes that elimination of the lumped-up mass of engine under the hood by distribution of power components around the vehicle could result in a car the size of a Volkswagen with the ride and performance of an Imperial up to speeds of 60 mph. In such an arrangement, electric motors probably would be located adjacent to each wheel.

The fuel cell Dr Lewis is talking about is familiar, in reverse, to every high school student. This is the classic experiment of passing current through water in a U-shaped tube and collecting hydrogen and oxygen at the respective ends. The fuel cell, on the other hand, is a device that receives hydrogen and oxygen to produce current. In experimental models, which are the size and shape of ordinary batteries, the fuel (hydrogen) is injected through the positive electrode and the oxidizer is fed down the negative one.

Chrysler's Lewis cites the dilemma: "Present cells are too large and too heavy for automotive installation by a factor of four. Not only that but the only cells that can now produce enough electricity to power a car operate under high pressure and high temperature. Volatile fuels under these conditions introduce a definite hazard."

On the bright side even now is the fact that fuel cell efficiencies are more than double that of the internal combustion engine. Eighty percent of what goes in is converted to useful energy. If an Oldsmobile were this good today, you would get well over 50 miles per gallon.

Today at least ingredients are a problem. Liquid hydrogen must be stored at —440 F. In small quantities evaporation is faster than with gasoline. Hydrides, where hydrogen is released from metals by the addition of heat or water, are extremely dangerous unless the reaction is absolutely controlled. Obtaining hydrogen from the catalytic decomposition of hydrocarbons is a possibility, but so far only at high temperatures. Ordinary denatured alcohol, obtainable in any drug store, seems like the best bet here. Oxygen, hopefully, will be obtained from the atmosphere.

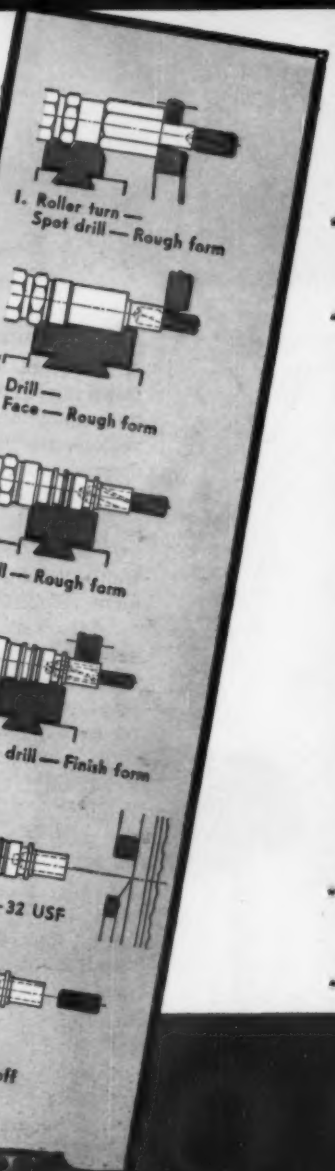
In spite of the problems that must be overcome before fuel cells are considered practical for automobiles, they remain, in the opinion of experts, very attractive for their potential simplicity, economy and thermodynamic advantages. Dr Lewis guesses that first applications will be on off-highway industrial vehicles where there is a built-in safety factor and regular programs of maintenance are in force.

At N Y International Auto Show...

Spot-checking foreign car makers seemed to substantiate the prediction that imports closest to US compacts in price and size would be hurt the most. Companies producing cars in this category reported sales down, about the same, or just slightly higher than last year. For imports in the VW class, however, there were reports of substantial sales increases. Also unaffected by the compacts are sports cars, luxury cars, and cars with unusual engineering features. Dealers handling imports competing with the compacts said they thought they could hold their own by stressing "the higher quality and better workmanship of the foreign car."

GREENLEE AUTOMATICS SPEED PRODUCTION of precision pump part...

The part is the injector cylinder of the Greenlee No. 798 High-Pressure Portable Power Pump manufactured by Greenlee Tool Co., a division of Greenlee Bros. & Co. Since the pump is capable of developing pressures up to 10,000 psi, extreme precision is required in producing the cylinder. It is machined from 1-inch hexagon 4150 chromium-molybdenum steel at a gross production rate of 48 pieces per hour. Sequence of the 13 operations performed is shown at right. Your Greenlee representative will be glad to help solve your precision part problems . . . just send us a print.


1. Roller turn — Spot drill — Rough form
2. Drill — Face — Rough form
3. Drill — Rough form
4. Bottom drill — Finish form
5. Thread 1"–32 USF
6. Ream — Cut off

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AIRCRAFT and MISSILES... TRENDS

Liberalized NASA patent policy...

Another hurdle has been overcome in the fight to liberalize the civilian space agency's patent policies. The House Space Committee has approved a bill to allow NASA contractors to keep patent rights (except for royalty-free government use) on any developments growing out of research on a space contract. This would be in line with the patent policy on Defense Dept contracts.

The outlook for Congressional approval of the bill is uncertain. The major obstacles: Sen O'Mahoney of the Senate Patents Subcommittee and Sen Long of the Senate Small Business Committee. Both are plumping for a uniform government policy to bar patent rights on government-financed research as a means of "guaranteeing the widest possible dissemination of the fruits of government-financed research." The present NASA patent law was designed to prevent companies from gaining patent advantages out of government research contracts in the infant field of astronautics. But NASA officials have argued for changes to make the policy consistent with the Pentagon's. They say they have trouble placing contracts as a result of the restriction clamped on by law—a restriction similar to the one imposed on AEC contractors.

Army seeks new helicopter . . .

Army plans to hold design competition for a new light observation helicopter to replace three planes now in service—Cessna's L-19, Bell's H-13, and Hiller's H-23.

Two different designs will be selected for development. Testing is scheduled to begin in 1963. Production and procurement is planned to start no later than two years after that.

The new plane will be lighter and smaller than the H-13, will cruise at about 126 mph, operate for a minimum of three hours without landing, and have a 400-lb payload (excluding pilot and three-hours' fuel) under hot weather, high-altitude flight conditions. As the design is now envisaged, it will be powered by a lightweight turbine engine.

Missile outlook bright . . .

Extremely optimistic reports on the status of various missiles were presented at the recent AIEE Space Technology conference in Dallas. One of the most optimistic concerned the Navy's Polaris. There will be two submarines—the George Washington and the Patrick Henry—equipped to "fire in anger" Polaris missiles this year, some two years ahead of schedule, reported Captain K M Tebo, head of the Program Evaluation Branch of the Navy's Special Projects.

Captain Tebo said these missiles will have a range of 1200 miles, and each sub will carry 16 missiles. Tests have shown the Polaris to have a range of 2000 to 2500 miles.

The Army will have the Minuteman ICBM in large numbers by 1963, said Col E S Chandler, director of the Minuteman Weapons System program. He, too, spoke optimistically of this missile's development, but urged greater emphasis on simplicity of equipment. This, he said, will automatically increase equipment reliability.

W W Carter, chief scientist at the Army's Redstone Arsenal, said no further breakthrough is necessary for the production of the Nike-Zeus anti-missile system in its present configuration. He said a shot is planned later this year that will attempt to knock out a missile on a 1600-mile flight.

Richard E Horner, Associate Administrator of NASA, told engineers that equipment reliability will soon become the number one problem in the nation's space program, replacing that of engine thrust. Propulsion systems now in development, he said, will provide the thrust needed for deep space probes in the next two to five years.

Speaking of satellites, Horner said current plans call for maximum 40,000 to 50,000-lb loads to be lifted by 1966. During the last half of the 60's plans are for 300,000 lb per year to be lifted, much of which will be in the form of light objects for communications projects.

B-58 Hustler production line at Convair-Fort Worth shows bombers moving down the assembly line on rails about eight feet above the floor of the 4000-ft-long factory building. The first SAC unit using B-58s is 43rd Bomb Wing, Carswell AFB, Forth Worth

BULLETIN NO. PO 66D

CUSHMAN

George - This looks like the answer to our problem. Have their rep. come in.
H.R.B.

air operated CHUCKING EQUIPMENT

INCREASES PRODUCTION
LOWERS COSTS
REDUCES FATIGUE
IMPROVES QUALITY
DECREASES FLOOR TO FLOOR TIME

THE CUSHMAN CHUCK COMPANY • HARTFORD 2, CONNECTICUT

MACHINE TOOLS...

$600 million in '60...

Net new orders for cutting-type machine tools added up to $138.7 million during the first quarter. This compares with $105 million in 1959 and $71 million in 1958. Bookings this year have been on an annual basis of almost $555 million.

Machine tool distributors belonging to the AMTDA are of the opinion that business will run along at about the current level for several months, with perhaps a dip in the 30 to 60 days immediately preceding the Machine Tool Exposition in September.

This dip will be more than offset, however, by increased orders, stimulated by the Exposition, that will be placed in the fourth quarter.

It seems reasonable to expect that total bookings for the year will be around $600 million, or perhaps even higher. Net new orders in 1959 amounted to $509 million.

Shipments of cutting-type machine tools rose to $50 million in March, as against $40 million in February. Production in the first quarter got up to $127.7 million, or an annual rate of $511 million. Shipments were $88 million in the same quarter last year. Shipments in the year 1959 totaled $413 million.

Net new orders for forming-type machine tools were $37.3 million in the January-March period. That is equal to about $150 million on a yearly basis.

Verson to lease presses...

Verson Allsteel Press Co, Chicago, is instituting a long-term lease plan for its metal-forming presses and press brakes, with terms starting at three years. The lease program is being underwritten by the Nationwide Leasing Co, Chicago. Leasing will apply at all prices, from $1600 press brakes to custom-built presses at $750,000.

P&W to import French lathe...

Pratt & Whitney Co Inc, West Hartford, Conn, has made an arrangement with Les Innovation Mecanique, French builder, to import the latter's 10-inch production lathes and sell them in this country and throughout the western hemisphere.

These lathes will carry the Pratt & Whitney name and will round out the Pratt & Whitney line of lathes which now consists of toolroom types and Potter & Johnston automatics. The entire line of production and toolroom lathes will be sold through P&W sales organization.

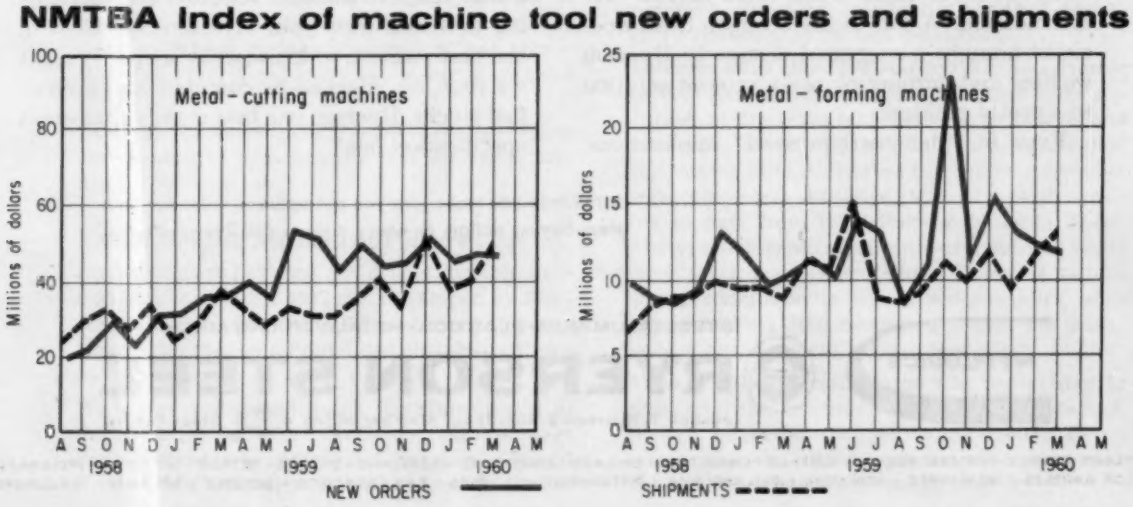
Pratt & Whitney already has an agreement with Alfred Herbert Ltd whereby the two companies have formed Pratt Whitney & Herbert Ltd to make Keller machines at the Herbert plant and sell them in the United Kingdom and the international market.

Regional seminar on tape control...

A Numerical Control Machine Tool Seminar is to be staged at the University of Washington at Seattle May 5-6.

This seminar is one of the first to be sponsored by a machine tool distributor—Starr Machinery Co, Seattle—as well as by a machine tool builder—Giddings & Lewis Machine Tool Co. Other sponsors are Concord Controls, General Electric, IBM, Thompson Ramo Wooldridge, and the Seattle chapter of the ASTME.

NMTBA Index of machine tool new orders and shipments



but only one was right for the job

Severe stresses imposed by this forming operation caused a high rate of reject for a fabricator using hot rolled plate to the usual ASTM—A7 specification. A call to his Ryerson Steel Specialist brought a suggested change to Ryerson welding and forming plate—a prompt solution to a costly problem.

Even in "plain carbon steel" applications, there's usually only one steel that's *exactly right* for each job. Nationwide, daily experience with a wide range of material selection and fabricating problems puts your Ryerson Specialist in the best position to know what is exactly right for *your* job. Backed by complete and diversified stocks, Ryerson can best supply that exact specification fast!

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MATERIALS...

Extruding clad metal...

Close dimensional control over the cladded product. A strong bond between the core and the cladding. And cladding that need not be the same contour as the core. These are three distinct advantages of a new extrusion process developed at Battelle Memorial Institute, Columbus, Ohio.

To clad by extrusion, the core material is fed through a hollow mandrel converging upon a die. The mandrel is housed within a chamber containing rams that are used to extrude the cladding material. As the rams advance, the cladding material is forced through ports in the chamber between the terminal end of the mandrel and the die. Thus, the core and cladding pass through the die simultaneously. Both core and cladding are heated in the extrusion chamber. It is possible to operate the process continuously.

A M Hall, chief of the Institute's Alloy Development Division, pointed out that, because the separate die governs the shape of the cladding, the latter need not be the same shape as the core. Products range from simple cladded rods to hollow cores overlaid with cladded fins. Much of the work has involved aluminum-clad steel but the technique also can clad aluminum on copper and nickel—and on alloys of these metals.

Where an actual bond is not desired, the nature of the process permits control to create a "sheathing." It also can produce integral bonds or simple mechanical bonds. The sheathing effect permits metal cladding a core which has been coated with a non-metallic material. For instance, using a non-metallic electrical-insulation material could provide a transmission line with an outside metal casing resistant to corrosion and other destructive forces—or a co-axial conductor.

Other possibilities include heat-exchanger tubes and decorative load-bearing rods for metal furniture, vehicles, etc.

Extra-bright aluminum alloy...

Immediate applications for a new durable aluminum alloy, called 5657 and developed by Reynolds Metals Co, cover all interior and exterior trim uses in automobiles plus myriad uses in appliances.

With mirror-like brilliance, the alloy is said to be the brightest, most corrosion resistant ever made available to industry. According to David P Reynolds, executive vice president, this alloy will take two to three times more protective coating against corrosion and still be as bright as any commercial alloy now available—or with a normal coating, it is far brighter.

A high-purity, non-heat-treatable metal, alloy 5657 may be formed in all tempers as easily as alloy 5457, now widely used in the automotive industry.

Zinc demand up...

Zinc producers are boosting output to meet accelerating demand. Asarco's big refinery at Corpus Christi has stepped up production to full capacity (9000 tons per month) for the first time in three years. One reason: Growing requirements of the die-casting industry, which now supplies an average of 65-68 lbs of die-cast components for each car manufactured—as compared to about 55 lbs in 1956. Improved plating methods have helped zinc's position by giving up to 10 times longer surface life to die-cast zinc components.

Metal adhesives...

To develop quantitative data on the low-temperature strengths of the various adhesive types now available for structural purposes, the National Bureau of Standards, Boulder (Colo) Laboratories recently investigated four types.

In a project for Wright Air Development Center, tensile tests were conducted down to —424F with a filled-epoxide, three rubber-phenolic, four vinyl-phenolic, and two epoxy-phenolic resins. The epoxy-phenolics, both having a fiber glass supporting film, gave the best performance. The epoxide showed slightly less low-temperature strength, but faulty bonding apparently contributed to this condition.

Failures were classified respectively as adhesive or cohesive, depending upon whether they occurred at the interface between adhesive and adherend, or strictly within the adhesive and supporting film. Failure of the rubber-phenolics was completely adhesive, with the resin tending to part from the adherend in large flakes. The vinyl-phenolics also showed a marked tendency toward adhesive failure. Cohesive failure was predominant in the epoxy-phenolics, with approximately 30% occurring within the thickness of the supporting glass fiber cloth.

None of the materials tested was formulated to withstand the extreme test conditions to which it was subjected. The foregoing results in no way reflect the utility of these adhesives under normal environmental conditions.

A NEW *"COMPACT"* HITS THE MACHINE TOOL FIELD . . .

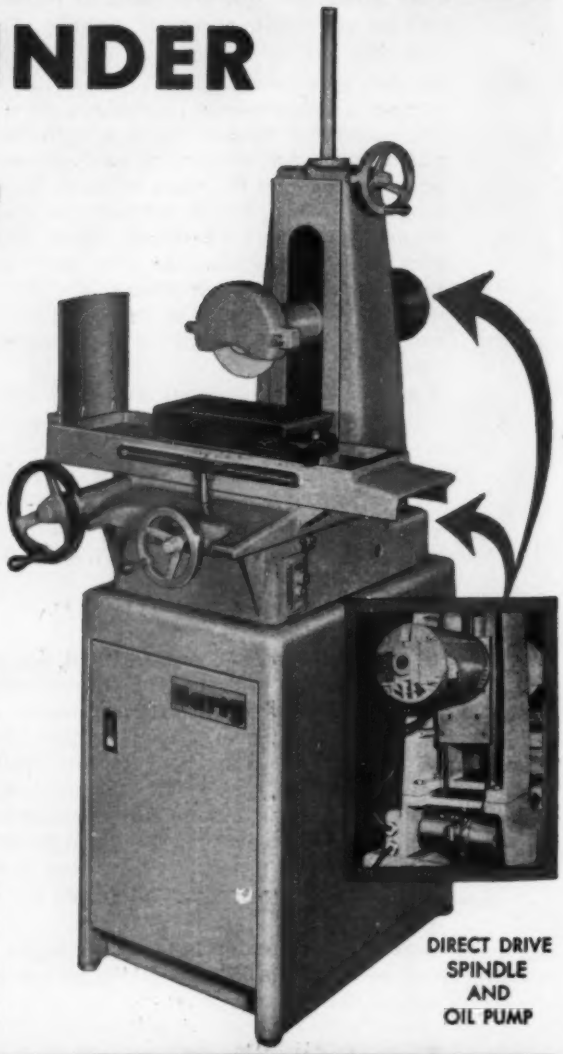
THE NEW HARIG 612 SURFACE GRINDER

with

* **Automatic forced lubrication**
  goes into operation as soon as machine is started — triples life of the ways and preserves original accuracy.
* **Direct drive spindle**
  increases power . . . reduces vibration . . . no V-belts to replace.
* **Your choice of right or left hand longitudinal feed**

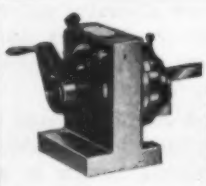
All Standard Equipment

The new 612 represents a break-thru in design and construction whereby Harig now offers industry a low-cost, precision surface grinder loaded with features usually found only on expensive models. Easy to operate . . . requires little maintenance . . . built with the precision quality you expect from Harig.



DIRECT DRIVE SPINDLE AND OIL PUMP

GET ALL THE FACTS . . .
Write for brochure on the Harig 612 Surface Grinder



HARIG'S NEW IMPROVED GRIND-ALL FIXTURE
Easily grinds irregular shaped perforators concentric with shank within ±.0001 accuracy. Also can be used as milling, boring and inspection fixture. NEW ATTACHMENTS: Radius Dresser Arm and Ball Seat Punch Adapter. (Write for new Grind-All Brochure.)

Harig
Manufacturing Corp

5743 W. HOWARD ST. • CHICAGO 48, ILL.

WHAT'S AHEAD... in Metalworking

TRENDS

Metalworking's capital spending to rise 36% . . .

The AM/MM Index of Metalworking Production is holding steady at 108, the same level as in the past two months. But things should pick up again as capital spending gets rolling. The latest McGraw-Hill survey of capital spending plans shows that metalworking will spend $4.52 billion in 1960, a 36% increase over 1959. See page 93.

This steady state of business is reflected in many of the metalworking fields.

The National Screw Machine Products Association continues to predict that first quarter sales will be the high quarter for 1960. Latest monthly figures show a slight decline in orders but a pickup in shipments. Sales volume is expected to remain steady.

Metalworking job shops in the Cleveland area present a spotty picture. Despite a pickup in activity in recent weeks, operators report an uneasiness which makes planning uncertain. But their outlook for 1960 is still good. Chicago shops reported business about 10 to 15% better than last year at this time, with backlogs holding steady and prices firm.

Commercial heat treaters still report static business, but at a level 5 to 10% above last year.

Latest monthly figures from the NTDMA show a 14% gain in sales, and though orders dropped 8% for the month they were still 12% higher than for the same period in 1959. Backlogs continue to grow, and are now 27% higher than last year.

Aircraft parts producers report little change in activity. Outlook at the beginning of the year was for slow, but steady, business volume—and the outlook is unchanged. First quarter sales took the expected drop, and no improvement is seen for the remainder of the year.

Industrial fastener orders are coming in slower, with a resulting drop in first quarter sales. Even though orders are now below those of a year ago, the outlook is for an upturn early in the third quarter of 1960. Shipments continue to rise and are well above 1959 levels.

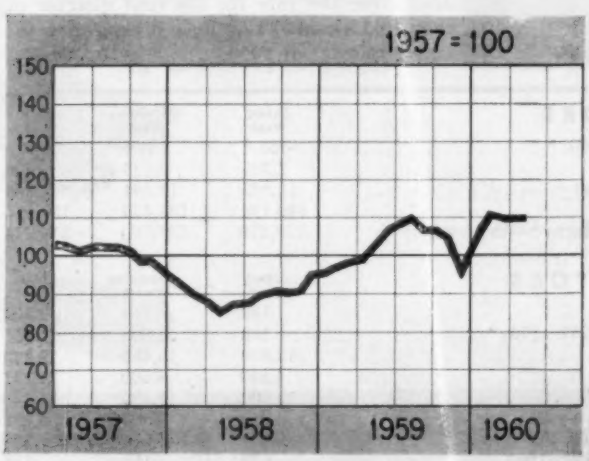
Materials handling equipment orders rose 14 points on the MHI monthly booking index. This marks two months of increasing orders. While the outlook has been tempered somewhat, the business picture is still good.

Radio and TV manufacturers report business stronger than in 1959, with retail sales continually increasing and sales exceeding last year's market.

Electronics firms on the West Coast appear to be running about one-third behind anticipated bookings since the first of the year. Despite uncertainty as to the life expectancy of some defense programs, electronics manufacturers foresee an increase in the percentage of defense money going into electronics, simply because weapons systems will require more and better instrumentation.

Foundry Equipment Manufacturers Association reports a healthy 34% jump in net orders closed for new equipment for the most recent month. But this figure is still way under 1959.

Plastic molding shops offer conflicting reports. One reports a drop of 12% from last year's volume, another says business is up 5% and increasing steadily since January. A third molder took a real sharp drop in January and has been going down ever since.

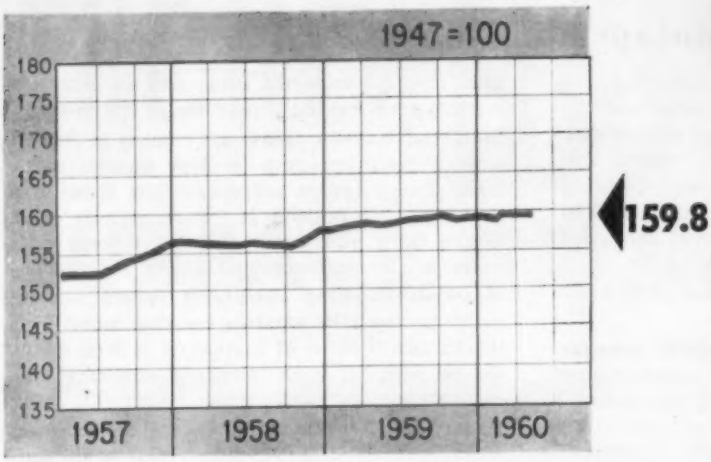


AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	APR. Estimated	MAR. Preliminary	FEB. Revised	MAR. Year Ago
Total Index	**108**	**108**	**108**	**98**
Machinery	105	104	93	
Electrical Machinery	115	115	100	
Autos	120	126	103	
Other Transportation	87	88	94	
Other Metalworking .	111	111	102	

TRENDS WHAT'S AHEAD... in Business



AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	APR. Estimated	MAR Preliminary	FEB. Revised	MAR. Year Ago
Total Index	**159.8**	**159.8**	**159.8**	**158.5**
Metalworking Machinery	**190.4**	**189.7**		**183.8**
Other Machinery exc. Electrical	**172.8**	**172.8**		**169.8**
Electrical Machinery	**162.3**	**162.4**		**159.4**
Fabricated Metal Products	**148.0**	**148.0**		**148.7**

The outlook still brightening ...

Industrial output took another dip in March, sending the index of industrial production down another point to 109 (1957 = 100), 2 points below the January high. But we can be fairly certain that the drop in industrial production has come to a halt. One reason for that conclusion is that there is new evidence of higher capital spending ahead—the latest McGraw-Hill survey of business plans (see p93).

One factor behind cuts in industrial output in recent weeks has been a slowdown in the rate of inventory building. Especially in autos and steel, inventories has grown faster than expected since the beginning of the year.

Sales of durables are bound to pick up. That's pretty well established by the McGraw-Hill survey indicating an increase of 16% in capital spending this year.

First indications of a pickup in sales of durables have already come through the increase in new orders for durable goods in recent weeks. Durable goods orders had lagged this year despite the expected increase in capital spending. And the lag in orders was one reason why jitters over the business outlook were developing. As the plans for higher capital spending materialize, we can expect to see further increases in the volume of new orders. Thus capital spending will be giving production and business generally a boost through 1960.

Gains in overall business as represented by the gross national product won't be as large in the second quarter of the year as in the first—largely because inventories won't be growing as rapidly. Nevertheless, there is little doubt that there will be considerable gains in overall business before we reach mid-year. On an annual rate basis, GNP for the second quarter of the year should hit $505 billion, an increase of $7 billion over the rate for the first quarter of this year, and almost $21 billion higher than for the second quarter of 1959.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	151.7	151.1	150.6
Steel ingot operation (thousands of tons)	2,305	2,225	2,646
Electric power output (million Kilowatt hours)	13,263	13,494	12,609
Production of automobiles and trucks	140,160	133,460	135,934
Engineering construction awards (Eng. News-Record—thousands)	758,270	397,760	314,274

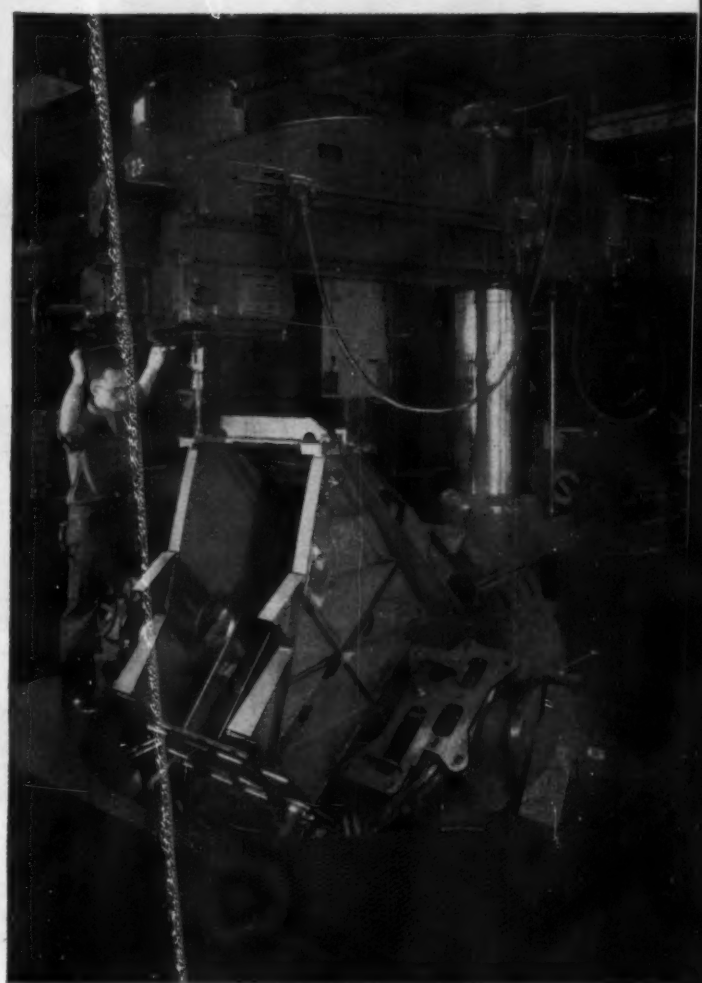
MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1957=100)*	109	110	104
Index of durable manufactures production (1957=100)*	108	109	101
Durable goods manufacturers' sales, millions*	15,670	15,450	13,870
Machinery manufacturers' sales, millions*	4,840	4,800	4,131
Durable goods manufacturers' new orders, millions	14,800	14,190	14,918
Machinery manufacturers' new orders, millions	4,910	4,630	4,198
New Orders for Nonelectrical Machinery (1950=100)*	171	164	167
New Contracts for Industrial Construction (1950=100)	132	155	115

*Seasonally adjusted

A Winning Combination...

"American" HOLE WIZARD RADIAL } + { INGENIOUSLY DESIGNED FIXTURES

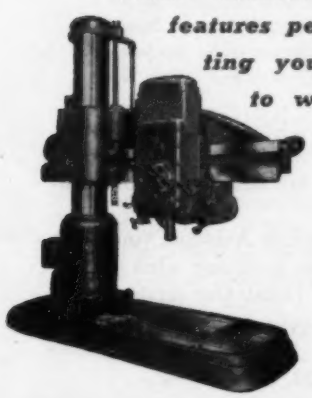


The time on this job was cut to the bone by the combination shown by the illustration. All boring, facing, drilling, tapping and counterboring on the entire job was done in one work setting by means of an ingenious swiveling fixture.

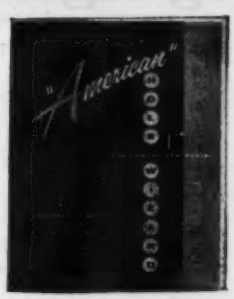
The essential contributor to satisfactorily performing this variety of work is unquestionably the "AMERICAN" Double Lo-Hung Spindle Drive. This is an exclusive "AMERICAN" Hole Wizard feature. It divides the speed range into two separate ranges; the high speeds through a comparatively small gear to minimize gear velocities; the low speeds through a large diameter, wide faced gear to reduce gear tooth pressures to insure minimized wear under severe service.

To further reduce wear and to insure maintenance of original accuracy the spindle and sleeve are made of nitralloy steel nitrided for extreme surface hardness and are mounted on large precision Timken Bearings with convenient outside adjustment which guarantees maximum life, dependable operation and unequalled spindle stability for the life of the machine.

These exclusive "American" features permit your putting your radial drills to work at a profit



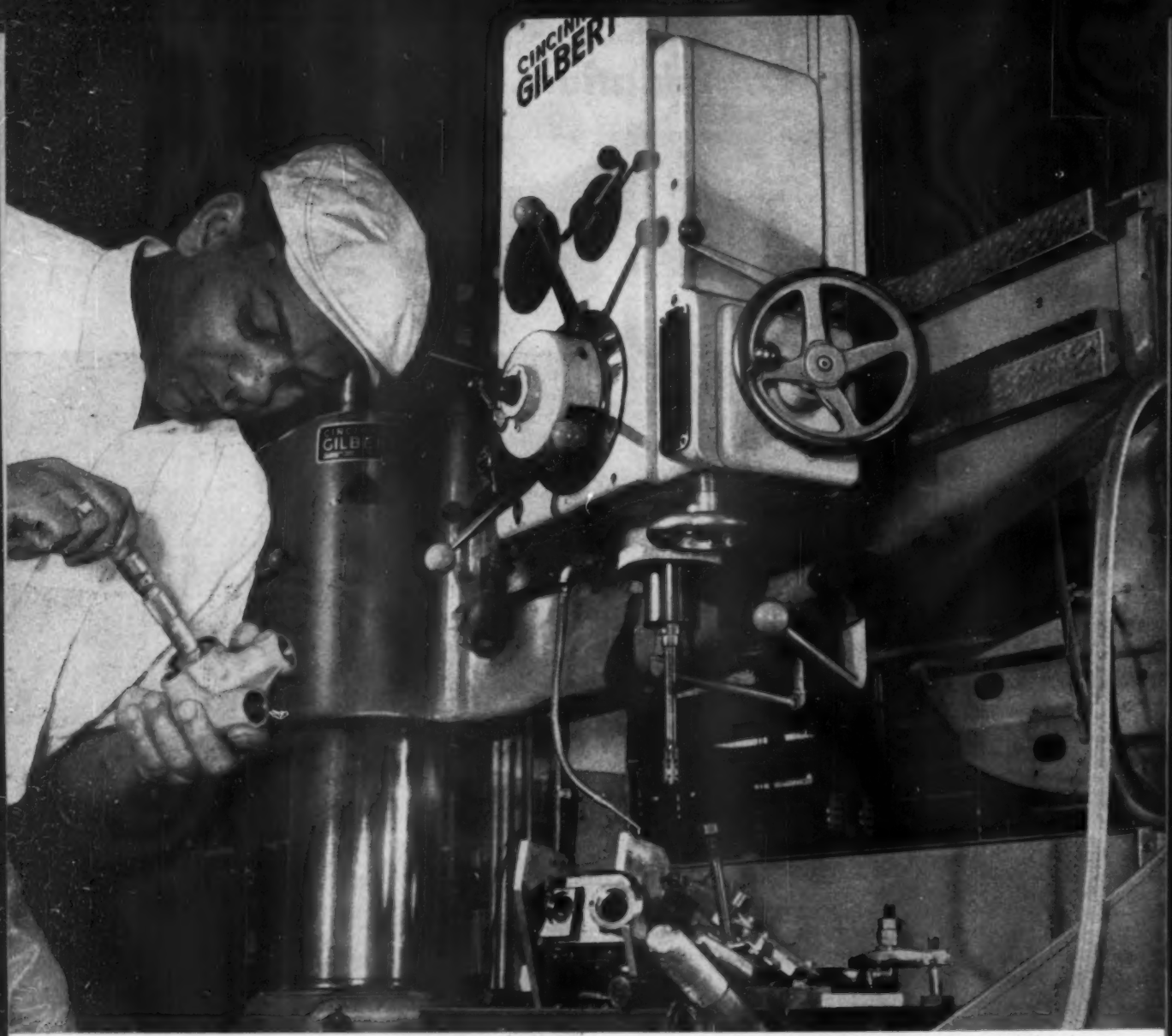
There are other advantages too — write for bulletin No. 328.



THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

CIRCLE 230 READER SERVICE CARD



Courtesy North American Aviation, Inc.

North American Aviation gauges it right on a Gilbert

He's gauging a part for North American Aviation's F-100 modification program. Checking to see if it meets tolerances of plus .0005″ and minus .001″.

Not much doubt in his mind because he knows what his Cincinnati Gilbert radial can do when the tolerances get tight (and, as you know, they're getting tighter all the time).

Full spindle support near the tool contributes to accuracy. So does the balanced arm, which resists torsion, compression, and tension forces. And so do many other details which are described in our Bulletin 349.

Along with North American Aviation, you join a fine company of meticulous craftsmen when you acquire a Cincinnati Gilbert radial. Our representative will be happy to call at your earliest convenience.

The Cincinnati Gilbert Machine Tool Co., 3340 Beekman St., Cincinnati 23, Ohio.

Write for free bulletin

GILBERT

American Machinist / Metalworking Manufacturing ESTABLISHED 1877

At the Right Place at the Right Time

Manpower promises to be one of Metalworking's big problems during the 1960s.

This fact may come as a jolt to those who have heard so much about automation that they feel that the real worry will be about enough jobs rather than enough men.

The shortages are likely to...

show up in almost all places except semiskilled and unskilled workers. Mechanization is crowding out this group.

But for every semiskilled and unskilled worker who is no longer needed, there will be a crying demand for a skilled shop man, a technician and an engineer.

Instead of relegating skills to the surplus pile in favor of unintelligent, poorly-educated, untrained button-pushers, automation is doing exactly the opposite. More skill than ever is necessary to stay in command of the machines—more skilled operators as well as more technical maintenance men.

As we advance rapidly into a more technological and complicated metalworking decade, we must also have well-trained management men in charge. There are not enough of them around, over and above the prospective shortage of skilled shop men, technicians and engineers during the next decade.

This disquieting situation...

is disclosed in a study made by the U S Department of Labor entitled "Manpower: Challenge of the 1960s." It also is dealt with vividly in an article published earlier this month in AM/MM about the skilled craftsman as today's vanishing American.

The Labor Department study reveals what Metalworking is going to be up against. During the next ten years the overall demand for workers is expected to rise by 25%. But openings for professional and technical people will, the study predicts, go up 41%.

Contrary to any idea that computers and self-service will take over from clerks and retail salesmen, the study predicts an increase of 27% in the numbers of clerical and sales help that will be required.

In the key working age group, from 25 to 44 years of age, there will be a gain of only 1.6 million persons. In the 35-to-44 year age bracket, a decline will occur. This is the group from which a high ratio of skilled workers, managers and executives is drawn.

On the whole, the Labor Department expects an increase of 13.5 million in available jobs by 1970. About half the required number, it is estimated, will come from the ranks of young people (14-to-24) entering the labor forces.

Most significant of all...

the study forecasts that women will have to becomes a much larger source of our labor supply than now. Nearly one-half of all women between 35 and 64 will be working in 1970. By then, one out of every three workers will be a woman.

These prospective developments should be of major concern to every metalworking company. They call for immediate action to set up a long-term program to insure an adequate, well-trained and competent supply of manpower at all levels. Every company that plans to grow with the national economy must take such action if it expects to have a labor force in sufficient numbers at the right place at the right time.

Burnham Finney EDITOR

Here are thread and form grinders that give you toolroom precision plus production line speed.

Plunge grind threads 1¾" long in a turn and a half or traverse grind long threads as fine as 60 pitch

And you have a choice of Crushtrue® wheel dressing (or multi-rib or single-rib diamond wheel-dressers) with manual or automatic crushing. Furthermore, Crushtrue dressing is ideal for grinding intricate profiles.

Sheffield's versatile standard Thread and Form Grinders (Model 101, illustrated, capacity 7″ diameter x 12″ long; Model 103, 7″ diameter x 24″ long) are equally at home in the tool room making one of a kind precision threads, or in the production line plunge grinding thousands of threaded or profiled parts.

Wheels may be diamond dressed . . . or Crushtrue® dressed for these advantages:

Greater production: wheel is sharper, grinds cooler. Faster stock removal: no dull flats, no burning, no loading up. Faster redressing: wheel is redressed in seconds. Highly accurate: tolerances on width within .0002″, radii within .002″, straight sides within .003″. RMS finishes as low as 8 microinch, grooves as narrow as .020″.

Standard accessories and special loading, holding, and ejection devices can be made available for specific high production jobs.

May we send you TFG 1159 catalog on models 101 and 103 and Bulletin CR 355 on the remarkable advantages of Crushtrue® grinding?

The **SHEFFIELD** *Corporation* *Dayton 1, Ohio*

A subsidiary of the Bendix Aviation Corporation

Gages, Measuring Instruments, Automatic Gaging & Assembly Systems • Machine Tools • Contract Mfg.

METALWORKING'S 1960 CAPITAL SPENDING PLANS

(Millions of dollars)

	1959 (Actual)	1960 (Planned)	1959-60 % change	Preliminary plans 1961	1962	1963
Machinery	$909	$1253	+38	$1068	$1055	$1108
Electrical machinery	519	763	+47	809	712	648
Autos, trucks, parts	641	1064	+66	872	802	898
Transportation equipment (aircraft, ships, RR)	390	468	+20	374	333	346
Other metalworking	876	973	+11	897	899	907
ALL METALWORKING	3335	4521	+36	4020	3801	3907

Metalworking will spend 36% more as

Capital spending booms in 1960

American business plans to spend a record $37.9 billion for new plants and equipment in 1960 and to maintain a high level of capital expenditures during the next three years. Metalworking will spend $4.52 billion in 1960, the greatest portion of it for replacement and modernization.

BREAKDOWN OF BUSINESS' SPENDING PLANS

(Millions of dollars)

INDUSTRY	1959 Actual	1960 Planned	1959-1960 % Change	Preliminary plans 1961	1962	1963
Iron & Steel	$1036	$1637	+58	$1522	$1142	$1039
Nonferrous metals	313	369	+18	347	357	346
ALL METALWORKING	3335	4521	+36	4020	3801	3907
Machinery	909	1253	+38	1068	1055	1108
Electrical machinery	519	763	+47	809	712	648
Autos, trucks, parts	641	1064	+66	872	802	898
Transportation equipment	390	468	+20	374	333	346
Other metalworking	876	973	+11	897	899	907
Chemicals	1235	1704	+38	1721	1687	1738
Paper and pulp	630	788	+25	678	556	578
Rubber	190	266	+40	245	198	188
Stone, clay & glass	529	695	+31	585	577	552
Petroleum & coal products	2491	2840	+14	2783	2811	3064
Food & beverages	825	874	+ 6	837	833	828
Beverages	203	241	+19	210	225	267
Food	622	633	+ 2	627	608	561
Textiles	412	480	+17	465	436	433
Miscellaneous manufacturing	1071	1069	0	958	932	945
ALL MANUFACTURING	12,067	15,243	+26	14,161	13,330	13,618
Mining	987	1007	+ 2	1015	864	895
Railroads	923	1071	+16	975	946	908
Other transportation and communications	4689	5168	+10	4657	4337	4355
Electric & gas utilities	5667	6207	+10	5545	5469	5631
Commercial	8210	9172	+12	8410	7882	7923
ALL BUSINESS	32,543	37,868	+16	34,763	32,828	33,330

American metalworking plans to spend $4.521 billion this year for new plant and equipment—a spectacular 36% increase over the $3.335 billion spent in 1959. Not only metalworking but all U S business will be spending more. Taken as a whole, business plans to spend a record $37.868 billion in 1969, 16% more than in 1959.

These are the findings of the latest McGraw-Hill Economics Department survey of capital spending plans. As usual, this survey also covers the preliminary spending plans for the next three years. Though the 1961 and 1962 figures for most industries show decreases in spending, it must be remembered that the farther these plans are in the future the more they tend to be on the low side, a point borne out by previous McGraw-Hill surveys. Yet four of the five segments of metalworking anticipate increases in capital spending in 1963.

The automotive industry (autos, trucks, and parts) will show the biggest percentage increase in capital spending in 1960, spending 66% more than last year. The survey further shows that of the $1.064 billion to be spent this year by the auto industry, 88% of it will go for replacement and modernization, only 12% for expansion. Sales should be up 7% this year and jump 23% in the period 1960-63.

Electrical machinery builders plan the next largest boost in capital spending. The $763-million expenditure planned here represents an in-

Capital spending . . .

crease of 47% over last year. Of this sum, 61% will be for replacement and modernization, 39% for expansion. Sales of electrical machinery, the survey points out, should be up 9% this year over last and up 23% in the period 1960-63. And remember, this is the one metalworking field that shows even higher capital spending plans for 1961 than for 1960.

Machinery manufacturers plan capital outlays of $1.253 billion—a gain of 38% over last year. Here, too, most of the money, 63%, will go for replacement and modernization, 37% for expansion. This year's sales should be up 9% over last year, and over the next three years sales should be up 20%.

The transportation equipment industry (aircraft, ships, railroads) plans to boost its capital investment to $468 million in 1960, an increase of 20% over 1958's $390 million. Modernization and replacement will account for 55% of the money, the remaining 45% going for expansion. The sales outlook here is for a 6% gain this year and a 14% increase in the period 1960-63.

"Other-metalworking" firms anticipate a boost in new plant and equipment spending of 11%, up from $876 million in 1959 to $973 million in 1960. This will be split 50-50 between expansion and modernization and replacement. Sales by these firms should be up 6% this year and up 14% in the next three years.

Metalworking, then, plans to spend 36% more this year than last on new plant and equipment, cut back about 11% in 1961 and 5% in 1962, then boost its outlay about 3% in 1963. All business, taken as a whole, will boost its capital spending 16% this year, cut back 8% in 1961 and 6% in 1962, then increase its outlays about 2% in 1963. But again, these two-and-three-year-ahead figures have always been low.

Research facilities

Metalworking's expenditures for research facilities will total $368 million in 1960. Of this sum, $66 million will be spent by machinery builders, $92 million by the electrical machinery industry, $53 million by automotive companies, $94 million by the transportation equipment manufacturers (which includes the research-oriented aircraft and missile industry), and the remaining $63 million by other metalworking concerns.

All these figures on capital spending are now directly comparable with those provided by the U S Dept of Commerce and the SEC (*AM/MM* —Mar 21 '60, p124).

Light crane for long span

Fabricating an aluminum bridge crane that has two girders 107 ft long is not an everyday job. However, the P & H Harnischfeger Corp found it could perform almost all the work with stock fixtures, welding equipment, and handling and positioning devices, some of which are shown on this issue's cover.

Aluminum crane structures are gaining favor in many plants, but in this 15-ton bridge crane for Kaiser Aluminum, its use was pushed beyond the customary applications. In fact the only major parts made of steel are the sheaves, gears, drums, and motor shafts.

All the main members, end trucks, trolley frame, and girder structures are 5083 H-113 aluminum, a heat-treatable, weldable material. The railings and platforms are 6061 T6 alloy. The gear cases for both the bridge and trolley drives are all alumium. Even the wheels on the bridge and trolley are aluminum forgings, and the electrical control cabinets are aluminum sheet.

No unusual problems

Web plates in the girders are 5/16 in. thick, and the top and bottom plates are 7/8 in. Starting with tungsten-arc shape-cutting, these parts moved through the shop without causing unusual difficulties.

When they reached the bridge shop, the girder parts were assembled into an all-welded structure by Mig welding (metal-arc, inert-gas). Argon gas at 50 cfh shielded the weld area, and 5183-alloy wire (1/16 and 3/32 in. dia) provided the filler metal. A typical setting on the constant-voltage power source was 240 amp DCRP and 27 v, for 1/16-in. wire.

With rotating fixtures the welders were able to do most of their work in the downhand position. Even in the final operations, the big girders were positioned by non-powered roller devices. The operators rotated the girder manually, or with crane assistance, and locked the part where they wanted it.

Standard fixturing

Mounted vertically on the rollers was a circular fixture with a rectangular opening cut through its center. These are standard fixtures at Harnischfeger, and they can be adapted to a variety of workpiece sizes.

Large assemblies such as the 107-ft girders are supported by two such fixtures. Cross bars and clamps center the work in the rectangular opening so the whole unit can be rotated to any desired position.

When completed, each girder was 81 in. high at the center by 18 in. through the cross section and weighed about 7 1/2 tons. A comparable steel girder would run in the neighborhood of 10 to 11 tons.

Of course, some parts of the crane had to be made of steel. For instance, steel rails are attached to the tops of the girders to serve as tracks for the trolley.

However, these rails are held in position by aluminum clips, closely spaced and welded to the top plate. A zinc chromate coating between the two metals prevents electrolytic action.

Light cranes pay off

When asked if an aluminum bridge crane wasn't somewhat of a luxury, a Harnischfeger official stated that, in certain applications, such a unit can easily make enough savings to outweigh its higher initial cost.

"The savings start the day you ship it. Its lighter weight means lower shipping cost, less difficulty and expense in installation, lower maintenance cost, and most important, less dead weight for the building to support."

An aluminum crane will impose 40 to 50% less weight on a building, and in a new plant, this can make an appreciable difference in the size and cost of framing members and foundations. In an older structure, when larger-capacity cranes are to be installed, it might save the cost of a complete remodeling job to beef up the building for the additional load.

For several years Harnischfeger has been testing an aluminum crane in routine operation, and the unit has stood up to all the use and abuse it has received.

Booth-to-booth legwork by three AM/MM editors gives you . . .

Highlights of the Tool Show

By Associate Editors Ben Brosheer, Charles Emerson and George De Groat

Some 35,000 visitors pushed past angry-eyed mumbling pickets to view the 570-odd exhibits of the 1960 Tool Show. What they saw inside Detroit's huge Artillery National Guard Armory was a big, busy Show bursting with new ideas, tools and machines. What they almost saw was an empty Armory.

Dog-tired exhibitors had been up all night setting up their booths with little or no outside assistance. Most of them made it just under the wire, despite a Carpenters' Union jurisdictional dispute that threatened to keep machines, materials—even exhibitors and visitors—from getting in.

But set up the Show on time they did, and opening day visitors found that 1960 is really a year of new tooling developments.

In the materials line, for instance:

Micromatic Hone showed Micro 99, a special grade steel with custom heat-treatment that is reported to equal or better carbide in wear ability.

Toughness is equal to that of tool steels, thermal expansion is the same as that of steel, and it has higher elasticity than carbide. Micro 99 can be welded to cores or backup blocks. Cost is lower than carbide. It is not, however, a cutting tool material.

Englehard-Hanovia showed selected "blocky" diamonds for metal-bonded grinding wheels. These are fairly regular, chunky diamond shapes which achieve strength, toughness, and long life, rather than the fast-cutting of needle-like shapes.

The company has data from recent tests, which show great superiority of selected diamonds (needle shape) over synthetic diamonds and natural diamonds not classified as to shape, both in performance and life.

In the hydraulic line:

Hannifin Co showed a crown pulse lubrication system for compressed-air power and other applications. Independent of pressure variations (though line air pressure powers it), the system pulses small amounts of lubricating oil to air valves and cylinders, even goes sharply uphill (which most others cannot) without jamming because of airlock. Oil is metered and controlled in quantity so as to reduce oil mist, and bypass the need for a separate high-pressure oil supply.

Fawick Corp, Cleveland, introduced a new adjustable press limit switch that controls ram stroke, and bolts directly to the press crankshaft, eliminating the usual sprockets and chain.

Stroke stop is adjustable, and the unit has electrical contacts like those of an auto distributor. Hannifin also has a new line of 1000-psi hydraulic power cylinders.

Numerical controls

Three exhibitors showed numerically-controlled machine tools. A small Burgmaster turret drilling machine was displayed by the Industrial Systems Division of Hughes Aircraft Co to demonstrate the latter's machine-tool numerical control system. This exhibitor also demonstrated a new tape preparation unit and a module tester for numerical control systems.

A numerical position control unit was demonstrated on a Moore precision jig borer by the Control Instrument Division of Warner & Swasey Co. This system is claimed to position the table of the jig borer within ± 0.00002 inches (20 millionths) of specified locations, in increments as small as 0.00001 in. The system uses standard 1-inch, 8-channel punched tapes.

Two drilling, tapping, reaming, and boring machines exhibited by Hillyer Corp have numerical control systems which locate table positions within 0.001 inch per foot. They normally use 4-in.-wide decimally-coded plastic control tapes. With a manual punch unit, this tape can be punched at the rate of 100 hole positions per hour.

If desired, the control systems used with these machines can be equipped with tape readers using 1-inch wide, 8-channel tape prepared in Flexowriters.

Carbide tool grinder

Hammond Machinery Builders exhibited several versions of a new oscillating electrolytic grinder for sharpening carbide-tipped cutting tools. Equipped with Anocut power packs, these grinders are available either with manual or automatic spark control. They are designed for low to medium volume tool sharpening requirements, and have an oscillating cup wheel at one end, and a wheel for grinding chip-breaker ledges at the other end.

A new V & O horizontal press, equipped with a specially-developed feed unit and capable of piercing and blanking light-gage metals and nonmetallic materials at speeds in excess of 1500 strokes per minute, was shown by Emhart Mfg Co's Hudson Division. This unit, completed just in time to be shipped to the Tool Show, has a vertical crankshaft, with the flywheel and clutch in the base of the machine. The ram slide is made of magnesium. Its double-roll feed is rack driven from a walking beam actuated by an eccentric at the top of the crankshaft.

Building-block induction heater

A new concept in building block construction for induction heating machines was shown by the Meta-Dynamics Division of Cincinnati Milling Machine Co in a new Inductron motor-generator induction heating machine. The machine consists of a unit-type monitor control station mounted on an integral heating station. An electrically work-driven feeding unit spin-progresses the part vertically through the heating coil. A new gas control cabinet for Flamatic flame heat-treating machines also was shown.

Delta Power Tool Division of Rockwell Mfg Co displayed a new power feed unit that can be fitted to any existing 20-in. Delta drill press.

Four mechanical deburring methods were demonstrated by Wheelabrator Corp—two of which are new with Wheelabrator. This company has for some years been making airless blast equipment (which deburrs parts with crushed walnut shells), and wet-blast deburring units. It has now added vibratory and barrel deburring units to its line. The vibratory process, introduced by Lord Chemical Corp, provides both a rotary tumbling action and a vibratory movement of the tub, thus in-

suring a three-way movement of the work in the liquid and abrasive media.

In addition to exhibiting a number of optical projectors for inspecting workpiece contours, based on units originally developed by Eastman Kodak Co, Ex-Cell-O Corp showed Robbins "Magna-Sine" angular setting tables, and announced that as of May 1 they are taking over the manufacture and sale of the Robbins line of adjustable tables. They will be produced at Ex-Cell-O's plant in Greenville, Ohio.

Prehoned carbide inserts

General Electric Co's Metallurgical Products Dept announced and demonstrated prehoned Carboloy cemented carbide throwaway toolbits in which the cutting edges are honed to precise radii to give the strongest possible geometric shape to withstand cutting pressures. Prehoning is claimed to minimize chipping and edge cracking of the tool bits.

General Electric application engineers say a large company in Dayton, Ohio, achieved a 30 to 35% improvement in tool life when prehoned carbide inserts were substituted for unhoned inserts. Amount of radius developed when honing is determined by the service requirements of the applications. Small radii are best for finish turning operations, semi-finishing and roughing cuts.

In addition, General Electric announced that man-made diamonds now are available for the production of metal bonded grinding wheels. The diamonds have irregular surfaces and blocky shapes, and are somewhat tougher than those made for resinoid and vitrified bonded wheels. Their surfaces are much more irregular than those of natural diamonds of similar size, giving the man-made diamonds improved bonding qualities.

Brown & Sharpe Mfg Co's Cutting Tool Division showed a new line of 45° carbide-tipped angular cutters for milling angular grooves and dovetails, and a new line of HSS "Thriftmills," which are claimed to put end mills in the throwaway class.

Grinding unit for jig borer

Precise Products Co demonstrated a new electric jig grinder attachment for jig borers and vertical milling machines that incorporates a 1/2-hp integral motor to drive the tool spindle at 15,000 to 45,000 rpm. Capable of developing finishes of 5 to 10 microinches when finishing holes in hardened steel parts with precision solid-carbide burrs, the unit will bore and finish holes from 3 1/-in. ID to the smallest for which a burr can be made (and easily is adjusted radially for size of hole while it is being used).

A small ultra-high speed hand tool for hand finishing tools and other parts was shown by the Ashcombe Co. Called the Ashcombe Airotor, this precisely-balanced tool uses small burrs and bonded wheels at speeds up to 300,000 rpm.

Inspection equipment

A new optical checking fixture developed by the Weldon Tool Co inspects helix, peripheral relief, radial rake and axial rake angles, and peripheral land widths, on boring tools, reamers and similar tools with 1/16 to 6 in. OD and straight shanks from 3/16 to 2 1/2 in. dia.

Fellows Gear Shaper Co demonstrated a gear tooth index measuring instrument adjustable for any number of indexes, or gear teeth, down to 24. It is possible to check gears with less than 24 teeth by providing for multiple indexing between each advance of the measuring stylus. Each index measurement is shown as a short plateau on a paper chart, and the greatest error between any two teeth is represented by difference between the highest and lowest plateaus.

Sheffield Corp showed a number of new gaging developments, including the "Eli Whitney Unipoint Holecheck"—a horizontal, internal comparator with standard amplifications of 10,000/20,000 to 1 and 20,000/40,000 to 1. Two of the three transducer-type pickup units are used in conjunction with gage blocks to accurately indicate movement of the table on which the workpiece is clamped.

Sheffield also showed a pneumatic recorder that automatically shows, on a paper strip, variations of air measurements from a single-column air gage—for continuous or intermittent gaging of production parts. Full scale range is from ± 0.0003 to ± 0.040 in. In addition, a novel drill detector with an air orifice located just above the cutting lip of the drill when in a retracted position, was demonstrated by Sheffield. It signals for machine stoppage immediately upon retraction of the drill head should a drill be broken, instead of waiting until a probe in a succeeding station indicates that a tool has not completed a desired hole.

Amher Mfg Co exhibited a novel universal layout machine that uses large indicator dials to show movements on "X" and "Y" axes about a supporting table of a vertical centerpunch. This minimizes layout time for multi-hole jigs, dies, etc. It is accurate within 0.001 in. in either direction of movement.

Foreign tools

Foreign exhibitors were as much in evidence as ever. More than 40 different firms from England, Canada, Sweden, Germany, Italy, Switzerland, Japan, and other countries presented machines, tools, and instruments either directly or through their distributors in this country.

In the field of optical tooling, Nippon Kogaku, KK, Tokyo, Japan, demonstrated comparators and autocollimators through their exclusive agents, Nikon, Inc. Both bench and floor-model comparators were shown with 12-in.-dia ground glass screens, three lens turrets, built-in condenser selectors and bulb-filament alignment lenses.

Sajo milling machines built by Sandins Mekaniska Verkstad, Varnamo, Sweden, were shown by Austin Industrial Corp of White Plains, N Y, and included several models of plain and universal as well as vertical machines. The firm's standard and heavy-duty shapers were equipped with universal tables and such extra equipment as tilting table tops, cutting attachments and automatic downfeed to head and an automatic tool lifter.

Reinhard Bohle KG, Werkzeugmaschinenfabrik, Bielefeld - Jollenbeck, Germany, demonstrated horizontal, universal and vertical knee-type machines, cycle milling machines, (for preselecting a program for automatic changes in feed directions and speeds) and production millers. The company also showed a line of copy milling machines with tracer controls for contour and 3-D milling. These machines are universal in that a selector switch permits using them as ordinary knee-type milling machines or as program milling machines.

Micromatic Hone Corp showed its recently acquired line of Shipman grinders made in England, while Canadian equipment was well represented by Elliott Ltd of Port Hope, Ontario, which demonstrated Victoria milling machines, Cardiff lathes, Progress drill presses, Excel grinding machines, Speedax band sawing machines and a line of Invecta shapers.

Electronically controlled milling machine operates from a program taken from a six-track tape, with pulse generators translating the information to the machine. Machine is built by Hitachi Seiki Co, controls by Fuji Tsushinki

Numerically controlled miller is perhaps the most expensive machine shown at the fair. Built by Hitachi Ltd, the 3-axis milling machine and its transistorized electronic controls were quoted at about $400,000

In Japan, too...

The accent is on numerical control

By Sol Sanders
AM/MM Tokyo Editor

Brightest stars at the recent Japan Industrial Fair were some 260 machine tools shown by sixty members of the Japan Machine Tool Manufacturers Association. And, by far, most of the attention was centered on the numerically controlled machines—a numerically controlled rolling mill, flame cutting machine, several milling machines, and a tape controlled combination jig borer and milling machine.

The machine-tool exhibits, previously grouped in one or two buildings, were spread throughout the Osaka fair grounds this year. Hundreds of new, small makers were showing lathes and drills for the new consumers' goods manufacturers springing up everywhere in Japan.

But it was in Hall No. 2, where the numerically controlled units were located, that most of the interest was generated. Speaking of these machines, one foreign observer, a longtime acquaintance of the Japanese industry, characterized them as "bluff"—an attempt by the highly competitive machine tool makers to gain prestige and reputation from such machines. But there was no doubt that the alliance of Japan's traditional toolmakers and its rapidly growing electronics industry was a competitive threat to be reckoned with.

Japanese electronics is taking a back seat to no one in development of theoretical concepts. And some of these were freely applied to the machines presented.

Yaskawa Electric Manufacturing Co's numerically controlled rolling mill made use of a digital programming device employing a Japanese semiconductor known as "parametron." The parametron is reported to be slower, but more reliable, than the transistor, and can be applied wherever excessive speed is not required.

The flame cutter shown by Toshiba was a tape-controlled unit capable of cutting plate five to 1000 mm thick (0.2 to 39.4 in.) at a speed of 800 mm per min (31.5 ipm). The machine takes plate up to 4x8 feet.

Hitachi Seiki showed a vertical milling machine with numerically controlled drive. A six-track tape carries instructions, and pulse generators translate the information to the machine.

Perhaps the most expensive machine at the fair was the numerically controlled milling machine displayed by Hitachi Ltd. Together with its transistorized electronic controls, the machine was quoted at $400,000.

A combination jig borer and milling machine with Mitsubishi numerically controlled tape-fed programming was shown by Shin Nippon Koki.

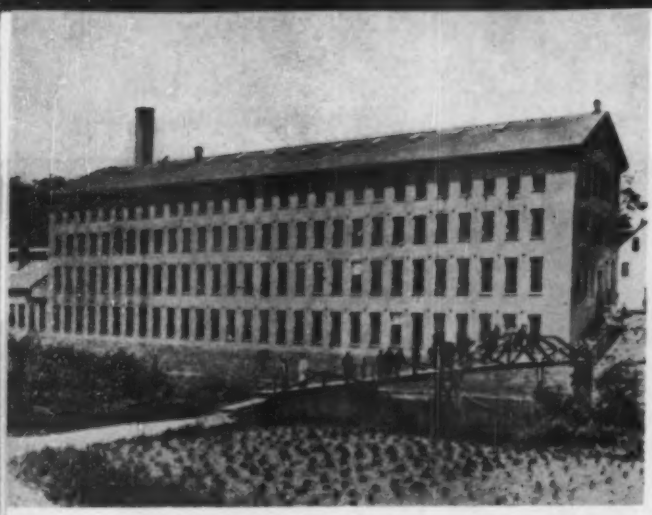
Also on display was the Ikegai-Japax automatic spark discharge machine. An official of Ikegai said that the company has entered into negotiations with Pratt & Whitney for licensing the machine to the American company for production in the United States.

Not every machine was numerically controlled. An outstanding example is the Makino jig borer and milling machine, which is believed to be of export quality. This machine features a Nikkon optical positioning system, and is designed for heavy duty. It will also be shown at a Japanese trade fair to be held in Moscow later this year.

Another attention-getter was the Shibaura Koki planer-miller with its square-blade design (this reportedly reduces pressure on the screw suspension). Table width is 78.7 in.

Fewer foreign machines

Foreign machine tool displays were fewer than in former years—perhaps a tribute to the growing power of the Japanese to supply their own needs. It is also a comment on the Japanese government's promise to liberalize imports of all kinds on foreign goods, something most foreign observers in Tokyo have taken with a good-sized grain of salt. Amertool, a giant U S trading company in Japan, had quite a sizable exhibit. The Japanese were particularly interested in a Pittler-Acme Gridley multi-spindle automatic.



YESTERDAY—P&W's first building

TODAY—14 buildings, 116-acres

Pratt & Whitney — 100 years of accuracy

A blue-streak talker and his company's star salesman. Rarely seen in the design room, almost never in the shop. Nevertheless, he could and did design almost anything in metal. This was Frank Pratt.

Rated by experts as the loudest, most eloquent, and most beautifully proficient swearer in the history of an industry that has produced more than its share of well-rounded cussers. This was Amos Whitney.

Together these men founded and built the Pratt & Whitney Company, which this month celebrates its 100th anniversary. This company, begun as a two-man shop its founders operated in off-hours from another Hartford factory, today produces some 2000 different items spanning the entire range of the machine tool, gage, and cutting tool industry.

Frank Pratt and Amos Whitney had somewhat parallel careers before joining forces. Both had worked at Colt's "Pistol Factory"—practically a graduate school of the country's finest mechanics. They eventually met at the Phoenix Iron Works and, while employed there, they rented the small room which was their first shop.

Their first noteworthy accomplishment was the production of automatic silk winding machines. This success was followed promptly by their first setback. Just as their shop was gaining a reputation, fire destroyed the room and all the equipment. In less than a year, however, they were back in business, at a new location that served through the period of the Civil War.

During the war, Pratt and Whitney developed the machine tools that made possible volume production of accurate firearms. Business boomed, and by 1862 more capital was needed. The partners each put up $1200, and the same amount was put into the concern by Monroe Stannard, who became a partner and took active charge of the shop. In 1865, when the original $3600 investment had grown to a capital worth of $75,000, the company started construction of the three-story building that was to be its home for 76 years.

Firearms work led the partners into further studies of parts interchangeability, and they soon realized that what was needed was a practical standard inch of exact dimensions. Many years of refining existing gages, and inventing new ones, gradually led (in 1882) to the historically famous Rogers-Bond comparator, a device capable of measuring to within one fifty-thousandth of an inch. And this work eventually led to the development of the Standard Measuring Machine, recognized the world over as the basic gage for construction and duplication of length standards.

Soon after the Franco-Prussian War, in 1870, Pratt & Whitney sold about $1.6 million of arms-making equipment to the German Government. In 1904 the company built tools, gages, and machinery for making shrapnel shells for the Japanese. Next came a U S Government order for gunsights for 6-in. naval guns.

Machine tools before 1900

Gun making, though important to the company's growth, actually represented only a small part of the total business. Prior to 1900, Pratt & Whitney had already designed and built many machine tools—lathes, boring mills, shapers, planers, vertical drills, screw machines, tapping machines, cam cutters, die sinkers, profilers, presses, and so on.

In 1901 Pratt & Whitney was purchased by Niles-Bement-Pond Co. From that time on, P&W dropped its excursions into other fields, except gun making as occasion demanded, and became what it is today — a manufacturer of machine tools, cutting tools, and gages.

During World War I the company helped develop the Hoke Precision Blocks, gage blocks guaranteed accurate within five millionths. A contemporary development was the precision jig borer.

In the slow business period from 1920 to 1925, Pratt & Whitney Aircraft Co was formed to develop and build the famed, radial air-cooled aircraft engine. This business was later sold to United Aircraft.

During the 30's the company's product line was filled out by the purchase of the John-Sons Co, manufacturer of roll thread snap gages, then by the purchase of Keller Mechanical Engineering Corp, inventor, in 1920, of automatic tracer-controlled milling.

In 1948 Pratt & Whitney bought Potter & Johnston Co, manufacturer of automatic turret lathes since 1898. The Sterling Die Co, maker of thread rolling dies, was acquired in 1955.

Today Pratt & Whitney operates, with Jacob J Jaeger as its president, as a subsidiary of Fairbanks Whitney Corp. Instead of two men, there are now about 2650 employees, and the company turns out, aside from its normal line, such items as tape-controlled jig borers, grinders, millers, and gaging machines—machines never dreamed of 100 years ago (or were they?) in that small rented room in Hartford.

Welding within thousandths

Because of the demands for ever-closer tolerances, and because of the new concepts being developed by the welding engineers—in techniques, in equipment, and in tooling—welding is fast approaching the point where a new name is needed to identify the kind of process that meets today's special problems.

One possible term for it is *machine welding*. As used by R L Hoetger of Thiokol Chemical Co and W B Moen of Air Reduction Sales Co, it means much more than the mere employment of a welding machine instead of manual welding. In their paper delivered last week at the AWS Annual Meeting in Los Angeles, they tell about the machines specifically designed for joining the parts of a prepackaged liquid rocket engine.

"Incorporated into these machines were precision controls for speed of rotation, welding current, filler-wire feed, and wire-feed positioning, plus programmed initiation, welding cycle, and shutdown." And they add that, "As the missile era enters high-production stages, it becomes evident that machine welding to close controls is necessary to achieve quality missile systems at reduced cost."

Along the same lines, J E Bartley of Aerojet-General Corp and R E Frala of Linde Co commented on the special tooling and fixtures developed to hold tight tolerances in thin-gage materials for large-diameter rocket motors. The material was low-alloy, high-strength steel in thicknesses ranging from 0.350 to 0.062 in.

Inside-out tooling

One of the main features is the inside-out approach to fixturing. All the welding is done on the ID of the work, at operating level regardless of the workpiece diameter. Among the benefits of this approach, they cite the natural restraint imposed on a cylinder by an outside clamp when the cylinder is heated, and also the absence of stress when it contracts upon cooling.

Further, this type of tooling makes it easier to supply back-up gas and preheat facilities. Post-heat is also important; the authors state that an integral part of the weld tooling is high-frequency induction equipment for stress-relieving the welds to prevent cracking.

Induction coils also figure prominently in a new technique for welding the fully-heat-treated, hot-work tool steels. To avoid post-weld heat treating the entire assembly, S S White of Alloyd Research Corp and M M D'Andrea and C E Hartbower of Watertown Arsenal mounted an induction coil on a radiograph carriage along with the Tig (tungsten, inert-gas) welding torch.

The trailing coil was especially designed to produce a constant-temperature zone embracing primarily those portions of the weldment heated above the A_1 temperature and to do it from one side of the plate. With this equipment, the authors produced weldments with short-time high-temperature tempers at 1200 F, 1300 F, and 1400 F.

In addition, they double tempered at these temperatures by passing the coil over the weld a second time, after the specimen had cooled to room temperature. The authors mention that a leading coil attached to the torch could preheat the work as well, but in this investigation, they were primarily interested in controlling the weld transformation products.

But while researchers such as these are developing the close control essential to machine welding, others are finding out more about the existing welding processes and improving them.

Some have found that slight changes in technique can have a large, and beneficial, effect on the completed weld. Two papers, for example, discuss the effect of simply increasing the length of wire extension (the distance from the electrical contact in the torch to the arc itself) in Mig welding (metal-arc, inert-gas).

R D Engel of Air Reduction Sales Co says that, when the extension is increased to 3 in. from the normal 1/2 to 3/4 in., the Mig process does a much better job of cladding and hardfacing. With the longer extension, the effect of resistance heating in the electrode wire increases considerably.

This increases the deposition rate of stainless steel, Inconel, and Monel electrode wires by 50 to 100%. At the same time, it permits a lower current setting, which reduces penetration and base-metal dilution.

These are the same conclusions reached by W T DeLong, J H Bradbury, and H F Reid of The McKay Co. In addition, these authors investigated joining as well as cladding, and they ran tests with extensions as great as 6 in. in both gas-shielded and submerged-arc welding.

"Overall results followed the same pattern irrespective of the welding process employed or the combination of base and filler metals tested." However, the effects were most pronounced when welding mild steel with the CO_2-shielded process.

In addition to the cladding application, the authors point out that the technique should be valuable for high-speed welding of thin-gage materials. They also suggest that higher deposition rates can be achieved without buying a larger power supply. For example, instead of depositing 20 lb per hr at 400 amps with a 1-in. wire extension, the same welding machine could deposit 30 lb per hr with a 4-in. extension—same current.

However, both these papers state that the welder must be equipped with an insulated wire guide to support the increased wire extension and that special provisions must be made for covering the weld area with shielding gas. Too, they both mention arc-starting problems that require special procedures or equipment.

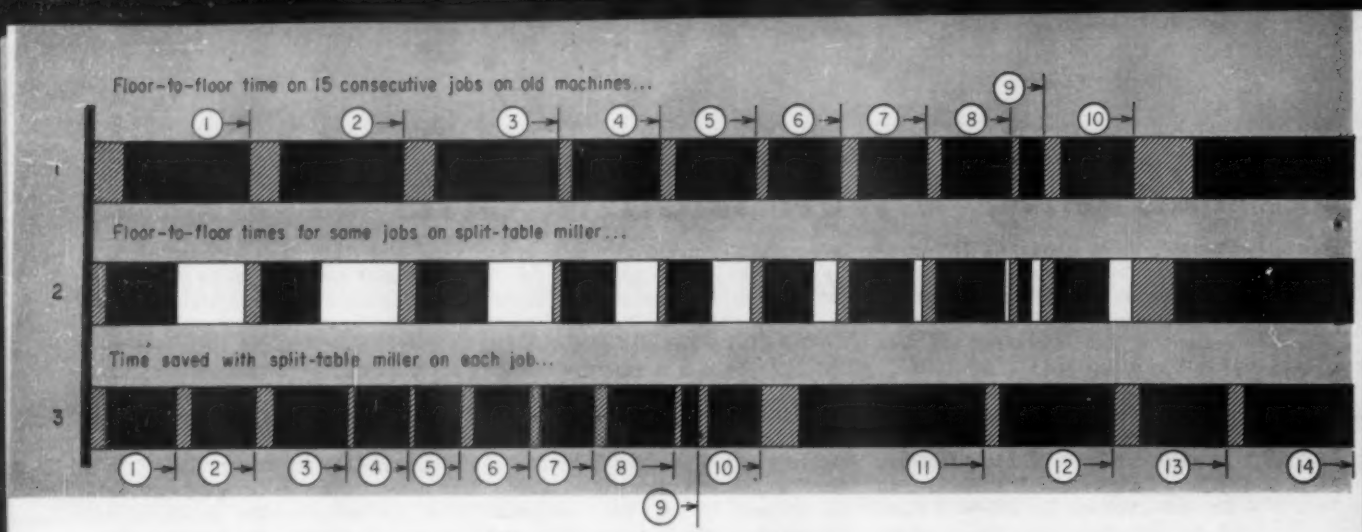
Small-wire welding

A number of other papers also dealt with CO_2-shielded welding, three of them on techniques employing small wires and reactor-connected power sources. And here's another place where a new generic term is needed.

T McElrath and G W Oyler claim that Linde Co's Short-arc welding, introduced last year, is not merely a variation of Mig welding but is actually a new process. They also state that Short-arc welding has been improved by a new push feeder for 0.030-in. wire and by a change from straight CO_2 to a mixture of 25% CO_2 with 75% argon.

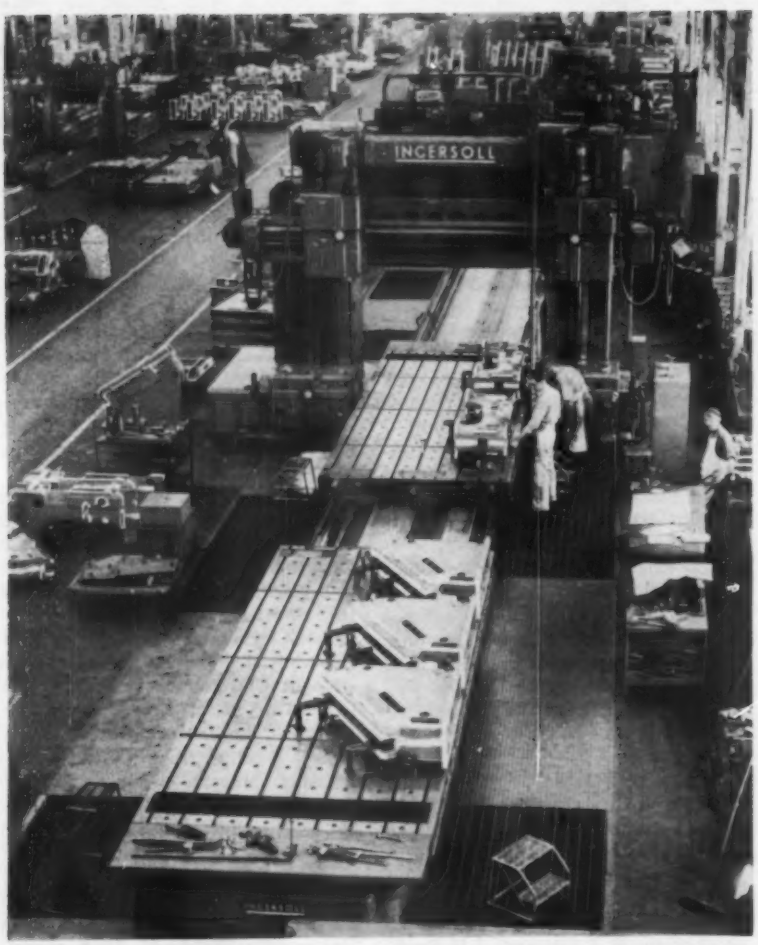
A 20:80 mixture of CO_2 and argon, says C R Sibley, makes Airco's Dip-transfer process suitable for all-position welding of HY-80 steel. HY-80 is the low-alloy, high-strength steel widely used in submarines.

Meanwhile, J H Hedapohl and H J Orr have thrown the Hobart hat in the ring by presenting a paper on "Micro-wire Welding." They recommend straight CO_2 at a rate of 12 cfh vs the 35 cfh usually specified for conventional CO_2 welding.



One planer-miller cuts job time an average 35% as . . .

Split tables save setup



Parts for the next machining cycle can be aligned and clamped on idle table section (foreground) of this split-table miller while machining operations are performed on parts on active table section (between machine columns). Result: a floor-to-floor time saving of 35%

A single machine is now doing the work of several smaller planers and milling machines at Greenlee, and it is rolling up an impressive record of production accomplishments in the doing.

For instance, the new heavy-duty, adjustable-rail milling machine, which is equipped with four 25-hp heads, has cut floor-to-floor time an average of 35% per job, even though it has been called upon to take heavier cuts at higher speeds and feeds than any of the machines it replaces.

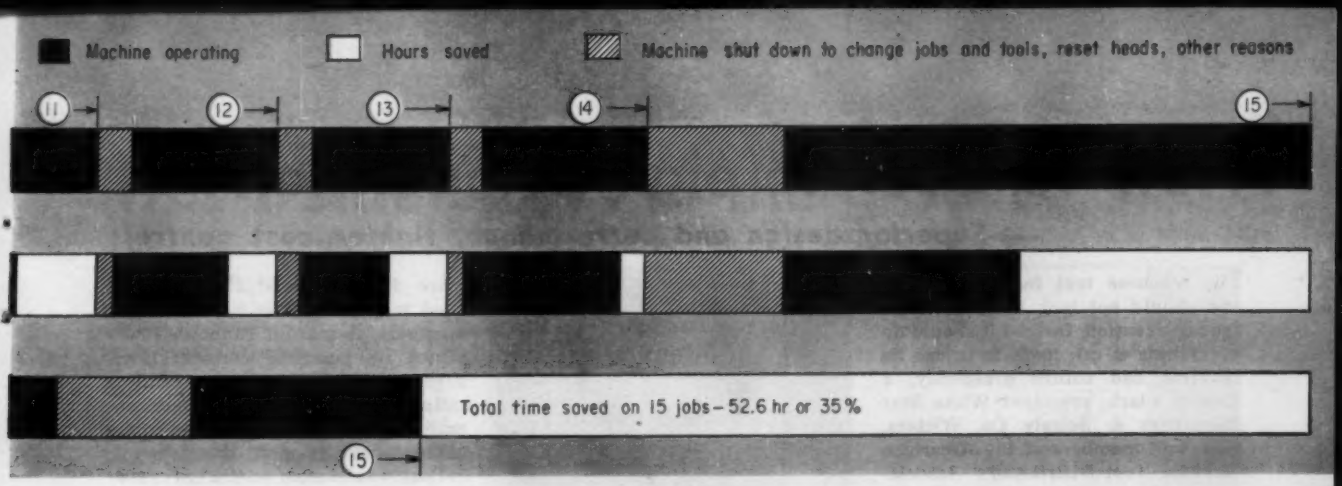
Equally important: Greenlee can now do jobs, such as machining of transfer machine parts, it once had to farm out because it didn't have machines big enough to handle the work.

The new Ingersoll miller has an 8-foot-wide, 34-foot-long table, which can be separated into two 17-foot-long sections, each of which can operate independently.

When long parts are to be machined, the table is used as a single 34-foot-long unit. But when smaller parts are processed, machining operations are performed on one or more parts clamped to one of the table sections. At the same time, other parts are aligned and clamped on the idle section.

This, of course, increases machine utilization, because the machine isn't down for setup any longer than it takes to change and position the cutting tools.

Job time comparisons for a series of 23 jobs recently machined in sequence on Greenlee's new miller are listed in the accompanying table,



Floor-to-floor times for 15 consecutive jobs show that work performed on old machine (top bar) took about 35% longer than the same jobs done on Greenlee's new planer-miller (center bar). Bottom bar shows amount of time saved on each job

time

By Harry E Ritter, works manager, Greenlee Bros & Co, Rockford, Ill

which shows that the miller cut floor-to-floor time 134:5 hours in performing the same work as did smaller planers and millers. The old method, which involved routing the work to several machines, required 385.5 hours to perform the 23-job sequence. Thus, the new machine's 134.5-hours' savings in production time amounts to a reduction of 35%. This, incidentally, is the savings ratio calculated during a similar study of 166 consecutive setups.

In calculating downtime under the old multi-machine method, it was necessary to take into account the time needed for aligning and clamping the work on the machine tables, for machine adjustments and tool changes, and for making all necessary measurements.

The same calculations for the new machine do not include part handling, or setup and clamping time—because this is done on the idle table section by two men while the operator is working on parts clamped to the active table section between the machine columns. Machine operating time in both cases includes all cutting time.

Normally, two-and-a-half men are assigned to the new planer-miller (two machine operators and an apprentice helper, whose time is divided between two machines). The two operators alternate between machine operation and setting up work when the machine table is divided into two sections. When the sections are joined together to handle large work, the two operators work together so as to increase machine productivity.

Comparison of actual times for all jobs handled in one period on split-table miller

Job No.	Time for Setups on Old Machines (Previous Methods)			Time for Setups on New Machine (Present Methods)			Hours Saved
	Machine Shut Down for Changes in Setup, Tools, Other Reasons	Machine Operating Time	Total Job Time	Machine Shut Down for Changes in Setup, Tools, Other Reasons	Machine Operating Time	Total Job Time	
1	1.8	7.2	9.0	1.0	3.7	4.7	4.3
2	1.8	7.2	9.0	1.0	3.6	4.6	4.4
3	1.8	7.2	9.0	0.9	3.8	4.7	4.3
4	1.3	4.5	5.8	0.8	2.6	3.4	2.4
5	1.2	4.6	5.8	0.7	2.6	3.3	2.5
6	1.0	3.9	4.9	0.8	2.6	3.4	1.5
7	1.0	3.9	4.9	0.8	3.6	4.4	0.5
8	1.0	4.2	5.2	0.7	4.1	4.8	0.4
9	0.7	1.2	1.9	0.6	0.8	1.4	0.5
10	1.0	3.7	4.7	0.7	2.5	3.2	1.5
11	3.7	14.6	18.3	2.7	10.5	13.2	5.1
12	2.0	8.3	10.3	1.0	6.5	7.5	2.8
13	2.1	8.3	10.4	1.1	5.9	7.0	3.4
14	1.8	9.4	11.2	1.0	8.6	9.6	1.6
15	7.8	31.3	39.1	8.0	13.7	21.7	17.4
16	7.9	31.2	39.1	7.5	14.2	21.7	17.4
17	20.0	30.0	50.0	13.0	19.5	32.5	17.5
18	20.0	30.0	50.0	13.0	20.0	33.0	17.0
19	20.0	30.0	50.0	13.0	18.7	31.7	18.3
20	3.6	13.8	17.4	2.6	11.4	14.0	3.4
21	3.6	17.4	21.0	2.6	11.4	14.0	7.0
22	1.0	3.4	4.4	0.6	3.0	3.6	0.8
23	1.0	3.1	4.1	0.7	2.9	3.6	0.5
Totals	107.1	278.4	385.5	74.8	176.2	251.0	134.5

Note: All values are given in decimal hours.

How to beat foreign competition

—Superior design and performance, tighter cost controls

The machine tool industry cannot and should not look to Washington for preservation. Instead it should do everything it can itself to insure its survival and future prosperity, J Russell Clark, president White Star Machinery & Supply Co, Wichita, Kan, told members of the American Machine Tool Distributors' Association in his presidential address at the spring meeting at White Sulphur Springs, W Va, April 18-20.

Mr Clark said that the industry should take a healthy look at itself and make certain that: 1) it is building the best machine tools that customers want and need; 2) it is not getting out of step with users either by falling behind or getting too far ahead in engineering; 3) it is as cost conscious as it urges its customers to be ("maybe a small dose of our own modernization medicine would help"); and 4) it is not using 1900 selling methods to compete in 1960.

"We get all shook up about our customers buying foreign tools," Mr Clark said, "because that affects our own pocketbooks. We don't get so shook up about ourselves buying foreign goods (watches, automobiles, Scotch whiskey) for our personal use." What is happening is that "we are no longer nationality conscious when it comes to the things we buy."

"Dollar sign" buying criteria?

More than that, the customer is not going to compromise and buy American if it costs more to buy more than he wants or needs, Mr Clark asserted. "If it will bend, punch, shape or remove metal, the dollar sign, rather than whether it is American or foreign, may be the determining criterion for making a purchase."

The machine tool industry can go the way of other good industries, such as the watch industry, Mr Clark pointed out, because too few people know that it is basic to the American way of life. "We as distributors and every salesman in the industry must understand one thing: Regardless of the source of its manufacture, a modern machine tool installed in the United States is one more fibre added to our economic strength and one more advantage in our economic race for survival."

First requisite for holding the domestic market in the face of European competition is for U S machine tool builders to develop machines of superior design and performance, Alan C Mattison, president National Machine Tool Builders Association and president Mattison Machine Works, Rockford, Ill, told AMTDA members. The industry is fulfilling this requirement and the results will be in evidence at the Machine Tool Exposition at Chicago in September.

AMTDA's Clark

"The customer is not going to buy American if it costs more to buy more than he wants or needs"

But in addition to outdesigning foreign competition, US builders must regain a tighter control over costs so that they can be truly competitive as to values, Mr Mattison declared. "We simply cannot continue to allow costs to run prices up to a point that will price us right out of the market."

Unfounded rumors have spread as a result of U S builders having set up production facilities in foreign countries, Mr Mattison said. These rumors have it that within five years American users will have to go abroad for their machine tools, so why not start buying foreign machines now? Mr Mattison stated flatly that "we are not taking capacity away from this country and putting it over there (Europe). We are establishing facilities over there because otherwise we cannot sell there (due to high production costs)."

Mr Mattison declared that the machine tool industry has every intention of maintaining adequate capacity in this country for national defense, for continuity of employment and for service to customers.

Consumers are not going to pay more for any product than they need to pay, Mr Mattison reminded members. A market cannot be sustained by marginal considerations, such as beauty of design, comfort and social prestige rather than cheaper transportation, as automobile makers have tried to do.

Reasonable and intelligent yardsticks should be used to measure selling performance of distributors, and compensation then should be related to this performance, Mr Mattison asserted. The yardsticks might well be quotas of calls on customers figured on an annual basis. Mr Mattison suggested as a starter an average of 4-1/2 calls a day for each salesman. There might be an incentive for exceeding the quota and a penalty for falling below it. After all, distribution is an element of cost, just like materials, labor or taxes, and should have the same careful consideration as any cost item.

A sound management analysis form for deciding upon the level of profitability of each line of machine tools was described in detail by William F Wolf, president Harron, Rickard & McCone of Southern California and chairman of the AMTDA management committee. "Each line must justify itself," he said. "We cannot carry a line unprofitably year after year, unless we have a valid reason for doing so."

The size of the Machine Tool Exposition—1960, to be held in Chicago at the Amphitheatre Sept 6-16, is indicated by the fact that a visitor can walk for three miles along the aisles if he wants to see all the exhibits. This bit of information was disclosed in a panel discussion on the exposition by George A Hawkins, Brown & Sharpe Mfg Co; Saul Poliak, Clapp & Poliak Inc; and R W Nissen, E L Essley Machinery Co.

A clinic on legal problems of distributor selling excited unusual interest among members. Joel Barlow, Weaver Dunnan and James R Patton of Covington & Burling, Washington, AMTDA counsel, conducted the clinic, with R W Banfield, president Motch & Merryweather Machinery Co, as moderator.

James C Kelley was elected executive vice president of AMTDA by the board of directors, Mr Clark announced. Heretofore he had been general manager.

This welder stays in the groove

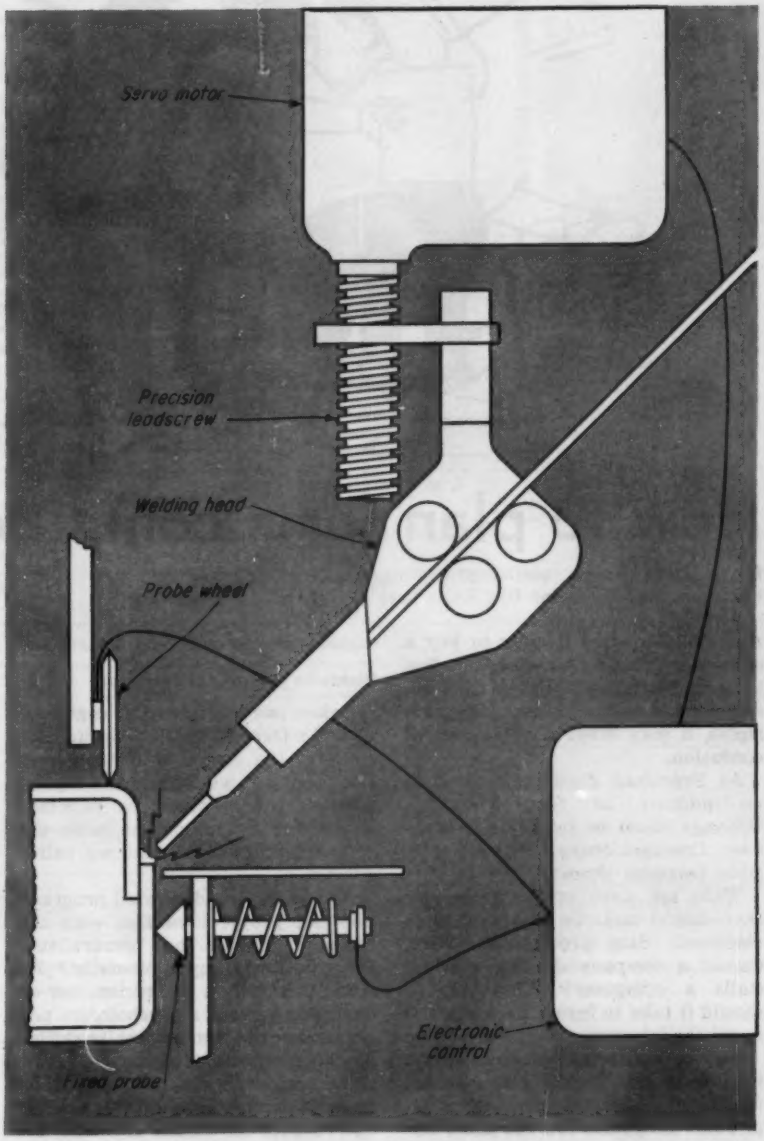
By Neil Granberg,
chief industrial engineer,
Automotive Division,
A O Smith Corporation

Here's a technique that guides an automatic welding head right down the center of the joint in spite of the irregular edges normally found on stamped automobile-frame members. Whenever the joint edge rises or dips, an electronic sensing system automatically adjusts the arc location to compensate.

Employed in making the front cross bar of a 1959 automobile, the technique was able to put the weld metal in the right place, even at a welding speed of 200 ipm. On these same joints, the maximum speed for manual welding was only 40 ipm.

Furthermore, with a welding head and control on each side of the cross bar, the machine welded the two 34-in. joints simultaneously. It made satisfactory welds with a maximum gap of 3/32 in. at the weld area when welding horizontally or down hill.

In operation, the parts are clamped into a locating fixture that carries the assembly past the two welding heads (A O Smith, 600-amp, constant-potential, CO-matic units). Welding starts automatically at the beginning of the joints and stops at the other end. Then, to complete the automatic cycle, the fixture returns to the starting position where the completed weldment is unloaded and the new parts are installed for the next cycle.



Electronic control keeps arc centered on joint while automatic machine welds auto frame members at 200 ipm. Sketch shows half of symmetrical setup that welds both both sides simultaneously

Balanced Control

The special feature of the machine, though, is the electronic sensing device that controls each arc's location and keeps it constantly centered in the weld groove. As shown above, the arc is depositing weld metal equally on the upper member of the assembly and on the edge of the lower member.

This situation is ideal, but, because of the stamping irregularities, it can change rapidly and frequently. The edge may stand up higher or lower at different locations along the part. A conventional welding machine would then throw more metal on one side of the groove or the other.

The electronic control, however, spots these deviations and corrects for them. When the arc is not centered in the weld groove, a current unbalance is set up because of a difference in voltage between the electrode wire and each of the two sides of the groove.

The control circuit amplifies these variations and signals the servo motor, which in turn, drives the precision leadscrew to raise or lower the welding head. In operation, each head is constantly oscillating a small amount as the correcting signals direct.

Spring-loaded probes are located along each side of the assembly and two probe wheels ride along the top of the work, one for each control system. These provide "ground" connections to the controls and keep the contact distances as uniform as possible for improved accuracy of the control adjustments.

How to plan for a computer

By J Hugh Burns, administrator, consultant relations,
Electronic Data Processing Div, Radio Corp of America, Camden, NJ

Any company that decides to buy a computer is taking a major step. But in what direction? Unless the decision evolves from clear, firm principles, it may breed a great deal of confusion.

As President Eisenhower said in an address at San Francisco, "Change based on principle is progress. Constant change without principle becomes chaos."

What are some of the principles that should underlie this change to electronic data processing? What should a company do *before* it installs a computer? What actions should it take to insure progress and avoid chaos?

Any company that plans to invest in a computer should never forget this most important principle: People, not machines, are the most important element in a computer installation.

Everette S Calhoun, Coordinator of Office Automation Research at Stanford University, puts it this way: "Electronic data-processing installations will live or die according to how well the men (and women) running them are trained. Successful applications are successful because of the *people*, not the machines, and the unsuccessful applications have failed principally because of lack of knowledge. Especially knowledge of how to apply the computer, to use it, to program it, and to integrate it into different situations."

Guide to personnel selection

Before we consider the organization of a Data-Processing Group (the staff for the computer installation), I suggest that we look at the type of individual who might be expected to succeed in making profitable use of the business tool that we call a computer.

Except for the dedicated programmer, all people identified with the computer should be "generalists." What do I mean by a generalist? He is not primarily a technician, nor an engineer; he's not a psychologist, and he need not be professionally skilled on the platform. But the generalist is an expert in the art of putting special things together. He is endowed with the knack of seeing the broad perspective. He can see the forest in a multiplicity of trees.

People of this type—when available in a company or when they can be recruited—should be trained for service on four different levels. Trained personnel on these four levels can staff the average industrial computer installation.

On the first level is a senior supervisor who will formulate the problems, direct the installation, or serve as a guide in establishing company policies that are consistent with potentials of the computer to be installed. He might be any of the following: 1) a tabulating supervisor, 2) a methods analyst, 3) an auditor, or 4) a technical assistant at the executive-officer level.

Whatever his position, this senior supervisor must know the computer's limitations and capabilities; and of course he must know some details on how the equipment can be applied.

At the second level is the programmer. He is responsible for the *detailed* solution of the data-processing problem and is guided in policy matters by the first-level supervisor. He might be a junior accountant or a junior methods analyst.

A third-level person is the computer operator, who is responsible for setting up the computer and its auxiliaries for a problem—such duties as mounting, labeling, and filing tape reels; operating the console; and maintaining the log of computer time. He might come from the ranks of the company's top tabulating operators.

The fourth level of personnel includes maintenance engineers and technicians. If the company can't recruit trained men from its own force, the computer manufacturer should be able to furnish them on a temporary basis, until the company has trained its own workers.

What kind of training?

To organize an electronic data-processing center, the company ought

PHASE 1		PHASE 2		PHASE 3		PHASE 4
Feasibility Studies	Equipment Selection	EDP System Development	Preparation for Conversion	Site Readying Training Programming and Testing	Equipment Installation	Production
counsel and guidance by industry specialists		counsel and guidance by industry specialists		counsel and guidance by industry specialists		counsel and guidance by industry specialists
		analysis of your procedures		analysis of your procedures		processing supervision
orientation of your management and staff		orientation of your management and staff		orientation of your management and staff		
EDP Center facilities and services		EDP Center facilities and services		EDP Center facilities and services		EDP Center facilities and services
		guidance on site selection and preparation		guidance on site selection and preparation		
counsel on personnel selection and organization		counsel on personnel selection and organization		counsel on personnel selection and organization		equipment maintenance
		personnel training—on-the-job and at RCA schools		personnel training—on-the-job and at RCA schools		personnel training—on-the-job and at RCA schools
		assistance in your public relations activities		assistance in your public relations activities		assistance in your public relations activities
		guidance in scheduling applications		guidance in scheduling applications		
		programming assistance		programming assistance		programming assistance
		automatic programming		automatic programming		
		library of service and functional routines		library of service and functional routines		library of service and functional routines
		program testing at EDP Centers		program testing at EDP Centers		
				installation supervision		
		product assurance		product assurance		product assurance
investigation for improved EDP operations		investigation for improved EDP operations		investigation for improved EDP operations		investigation for improved EDP operations

Four-phase program shows the planning a company should do before the computer actually goes into production. To assist the company, RCA provides extensive services, once the company has decided to invest in a computer

to relate training of the four personnel levels to three variables:

1. The size or "power" and characteristics of the computer that the company will buy
2. The problems that the computer will handle
3. The desired degree of competency for the computer staff

For example, the training needed to understand and use efficiently a 40-command computer obviously is longer than that for a 16-command one, if only by the time required to explain the additional 24 commands. And, of course, certain computer techniques, much more complex than others, require more training.

Many people think that business problems, compared to scientific calculations, are trivial computer applications. But a neutron diffusion problem coded for a particular computer might involve something less than 2000 instructions and constants; on the other hand, a weekly payroll and file maintenance program can require 6000.

Thus preliminary training for the computer is nothing to be sneezed at. It must be planned jointly by the company's top-level management and the computer manufacturer—well in advance of the planned installation.

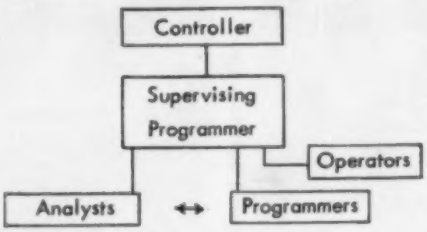
Psychological impact

Let's return to that most important principle we enunciated earlier. Among the very real problems we should always keep in mind is the psychological impact that installing a computer can have on the clerical work force of a company. Their immediate fear, of course, is that they will lose their jobs to the computer. Even if they don't, they fear a loss of prestige, of having to "play second fiddle to a piece of machinery."

One of the most important jobs any company can do is to reassure the fearful clerical worker that he still is a valuable asset. Actually, studies made by the Bureau of Labor Statistics show that job opportunities have increased, both in quantity and quality, *after* installation of a computer.

In one instance, an insurance company reduced its clerical force in one work area from 539 to 406—about 25%—but laid no one off, in conformity with company policy. Actually, the computer installation

TYPICAL EDP ORGANIZATION CHART



brought about a considerable upgrading of job content and skills. And the average weekly salaries increased in the department that was affected, because displaced clerical workers were given higher-grade work. Conversion to the new equipment was handled almost entirely by company people; only four technicians had to be brought in from outside.

Thus, experience in both government and commercial installations has shown that clerical workers receive fair treatment. We should always recognize the "feelings" of these people. Top management must keep its people informed and reassured—machines and people are *not* interchangeable.

Organizing for EDP

Now let us move along to the planning a company should do before installation of a computer. These are the preliminary steps that the user should take *before* approaching the computer manufacturer:

1. Top management should formulate a statement that explains the principle of change.
2. Competent methods analysts, or committees, should make a thorough feasibility study.
3. Top management should approve recommendations that come from the feasibility study.
4. An EDP group should be formed, probably reporting to the company controller. Reporting personnel should include the supervising programmer, operators, analysts, and programmers (see organization chart reproduced on this page).

Analysts must establish an effective liaison with department heads who will be even remotely concerned with the computer. They must, as it were, win friends and influence people on behalf of the entire program, at the same time securing complete information on data flow and other details.

Pertinent here, I believe, is a word of warning: The computer crosses departmental lines. In contemplating a computer installation, you must understand two things: 1) the organizational structure of your firm is subject to some contraction—layers of administration may be trimmed away; and 2) you must develop policies, programs, and techniques that will minimize the impact of these adjustments.

You see how we keep going back to the humanities? No problem is insoluble, if it can be stated. And how can you define a problem and then state it without communication among people?

The computer manufacturer should work closely with the company that buys his product. He should provide not only the equipment, but also the working knowledge that can help the company to fit the computer to its requirements. His experts should mingle with, work with the company's personnel. We at RCA follow this policy: Any computer is only as good as the customer's people make it. But industry *does* have talented people who can be trained to run a computer.

CHECKLIST FOR MANAGEMENT

Management planning for the organization of an EDP installation might include these points:

- **Management should determine the computer's potential for reducing cost and increasing efficiency.**
- **It should be willing to devote time and money to this feasibility study.**
- **An Electronic Data-Processing Group should be set up.**
- **The EDP group should make these preparatory studies:**
  - **A. Problem study**
  - **B. Machine study**
  - **C. Preliminary flow charts**
  - **D. Cost analysis**
  - **E. Final machine study**
  - **F. Programming study**
  - **G. Test installation study**
- **Top management committee should receive a demonstration, and make a review, of all the foregoing, to arrive at a final decision on whether to complete the installation.**

X-rays or isotopes?

Radiation by isotope is growing in popularity, but X-ray is still strong in a market that uses more and more radiation inspection. Which system is best for what? Here are some general rules by John A Reynolds, technical director, Picker X-Ray Corp (which produces both types of inspection equipment):

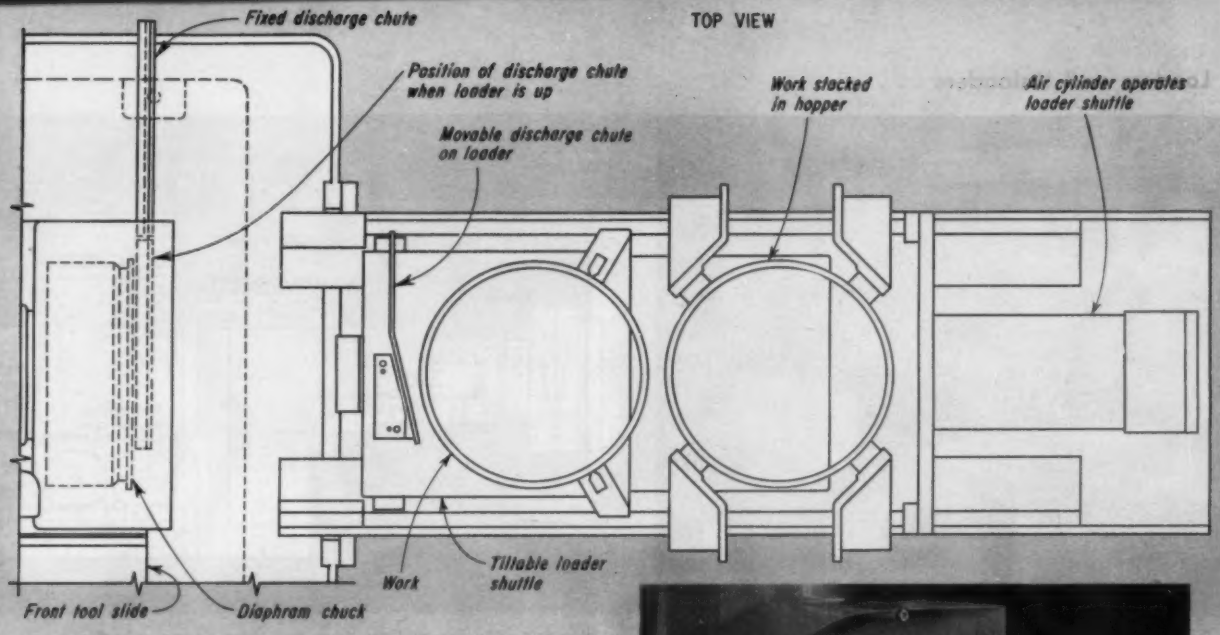
Cost — Isotopes have low initial and maintenance costs, but the radiation sources lose strength and must be replaced. A 50-curie unit costs $1950, where an X-ray machine for the same job (1-in. penetration in steel in 2½ min at 30-in. focal length) would cost around $7000. Replacement cost for the isotope would average around $1500 a year. On the other hand, cost for X-ray repair and maintenance might average $500 a year.

Power—Although more active isotopes are being developed, X-ray is still capable of producing more intense radiation, and can do a given job in shorter time. However, this costs electrical power.

Flexibility — X-ray can be turned on and off at will, and the equipment can be adjusted to provide different radiation levels. However, isotopes can be carried to the field in packages as light as 60 lb, and can be inserted into positions impossible for X-ray equipment.

Simplicity—Isotope units have only one variable—time—because radiation is constant.

Isotope handling has progressed beyond the primitive tube-and-crank arrangements, which are still available and often are most practical. One method has the isotope loaded in the rim of a wheel, which is rotated to bring the source to a shield window for exposure, or rotated back inside the shield for safety.



1. **Tilting shuttle handles ring gears.** Tailstock is replaced by a frame and rails on which shuttle is powered for longitudinal motion. Shuttle moves toward headstock, slides bottom gear blank from stack, and tilts up to vertical as it nears end of stroke. Diaphragm chuck releases machined gear blank, which drops to chute segment attached to shuttle, and rolls to fixed chute and to rear of lathe. Shuttle feeds gear blank to chuck, which grips the work as the shuttle retracts to start position, far right. Motions are powered by air cylinders to left of headstock and at right end of frame

LOADERS AND UNLOADERS for automatic lathes

By George B Seeberg, director of engineering,
Sundstrand Machine Tool Div, Sundstrand Corp, Rockford, Ill

American Machinist / Metalworking Manufacturing

Special Report No. 488 • May 2, 1960

It isn't hard to justify mechanized parts handling for automatic lathes when there are long production runs and the capital-equipment investment is low on a cost-per-piece basis. Mechanized handling removes human variables from the machine cycle time, allows one operator to tend several machines instead of only one or two, and helps dovetail the lathes into a conveyorized production line.

There are also some few cases where fairly small job lots can still justify mechanized handling, such as pins, bushings, or motor shafts that vary only in one or two dimensions from lot to lot, and for which the loaders, unloaders, and fixturing in the machines can

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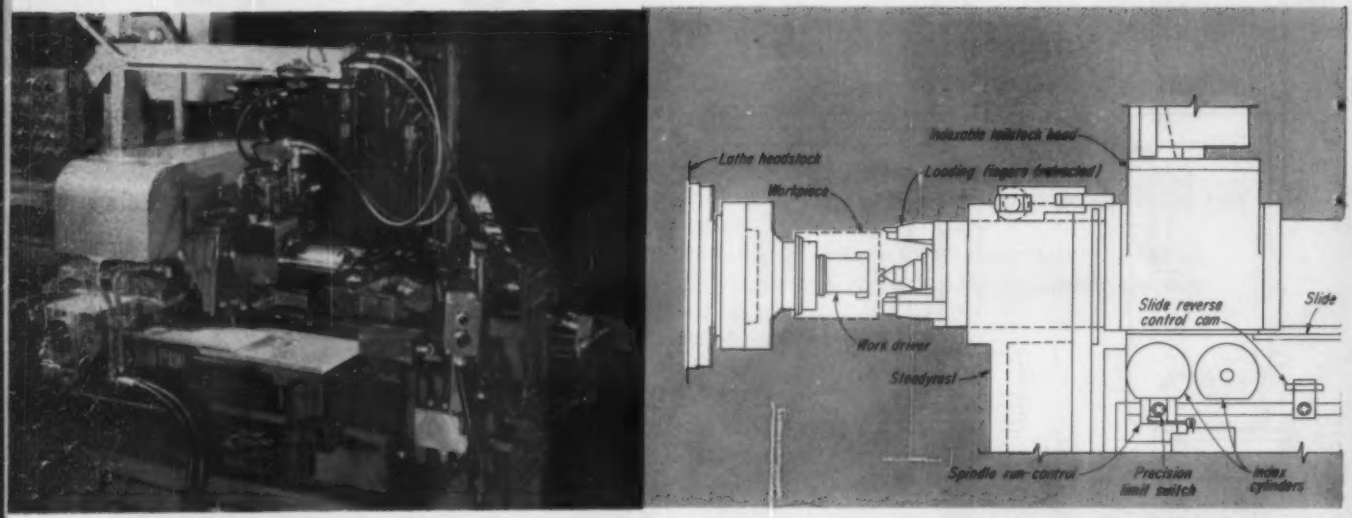
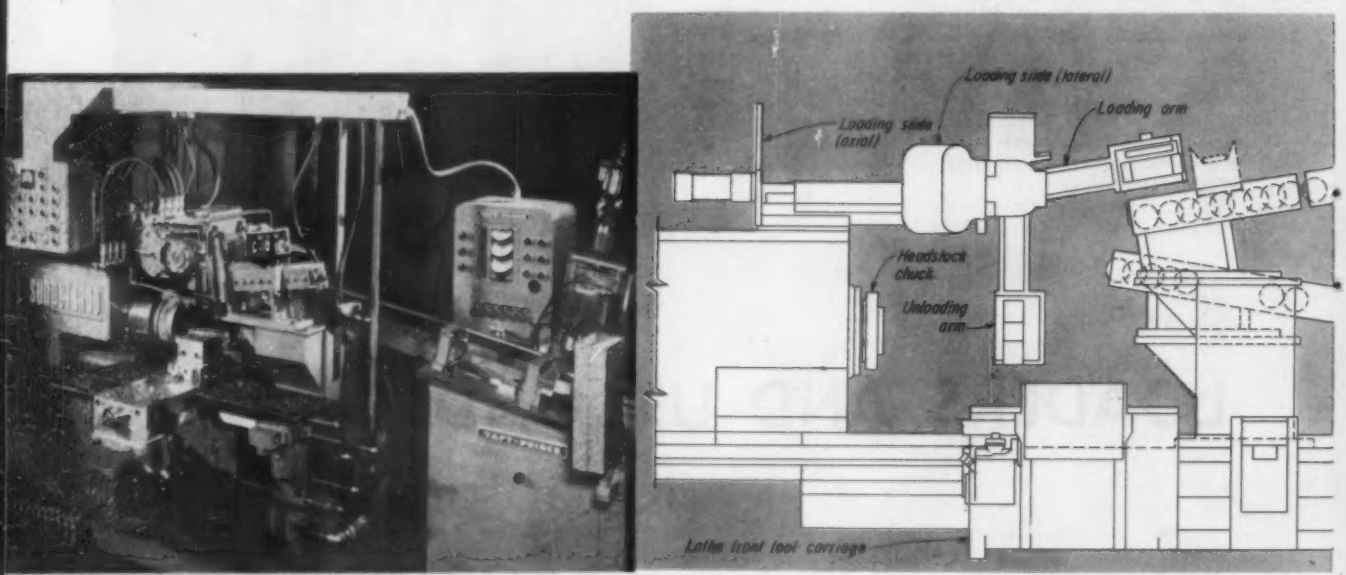


2. **Indexing head picks up pistons.** Die-cast piston blanks feed down chute at end of lathe bed. Tailstock slide moves right until tailstock center contacts work and three fingers grip the OD. Chute has unloading tray that prepositions pistons for



3. **Scissor arms transfer pistons.** Slide over the headstock carries two piston-gripping arms that load and unload the lathe chuck simultaneously. (Photos show only a stub of the loading conveyor during run-in period.) Slide moves axially and laterally

quickly be adjusted to accept all parts in a size range.

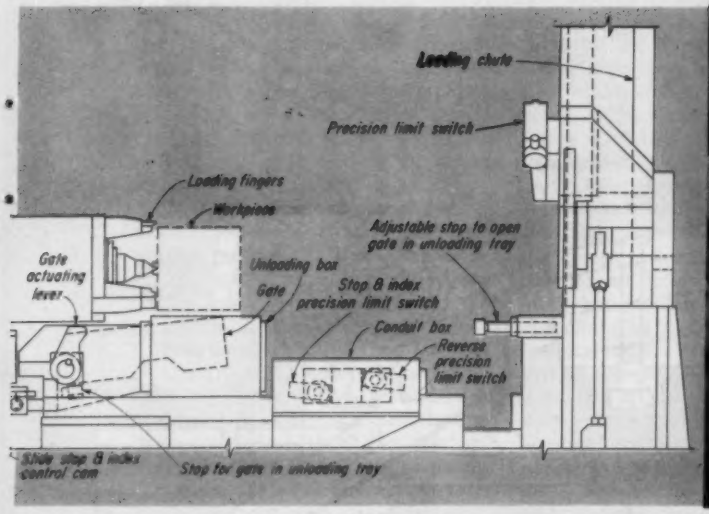
Mechanical loading and unloading has progressed considerably in recent years, with much variation in the mechanisms applied. The handling problems are complex, and there are many different ways to feed parts to machines.

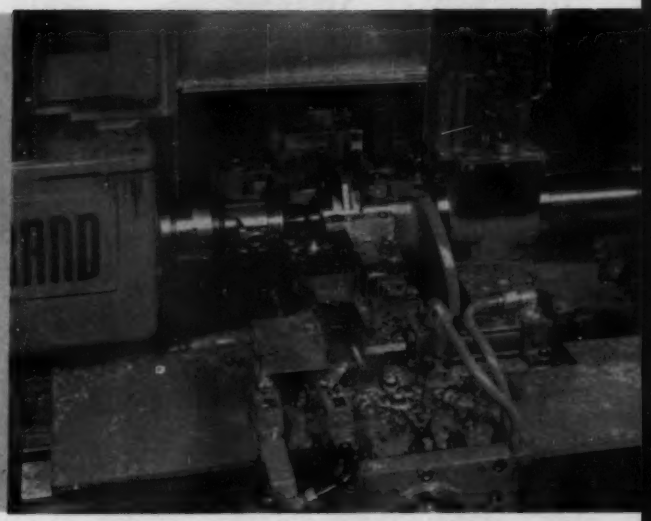
Handling equipment should be as simple as possible to reach maximum reliability and to simplify design and fabricating problems. Mechanical interlocks and timers are often more desirable than electrical and pneumatic counterparts because cost is lower and reliability may be better. But when parts handling must be timed carefully with machine cycles and adjacent conveyors, electric limit switches and solenoid valves are used with hydraulic and air cylinders for rapid, positive-sequenced functions of the loading equipment.

Design Selection Factors

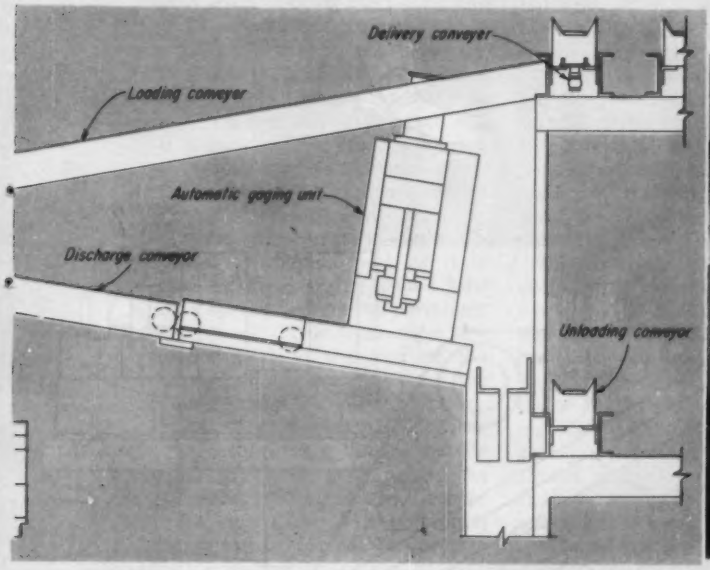
No hard-and-fast rules can be set down to govern the selection and detailed design of loaders and unloaders for automatic lathes — each job must be considered separately. In general, the following factors must be reviewed when determining whether workpieces can be handled automatically, and how their loading and unloading can be accomplished:

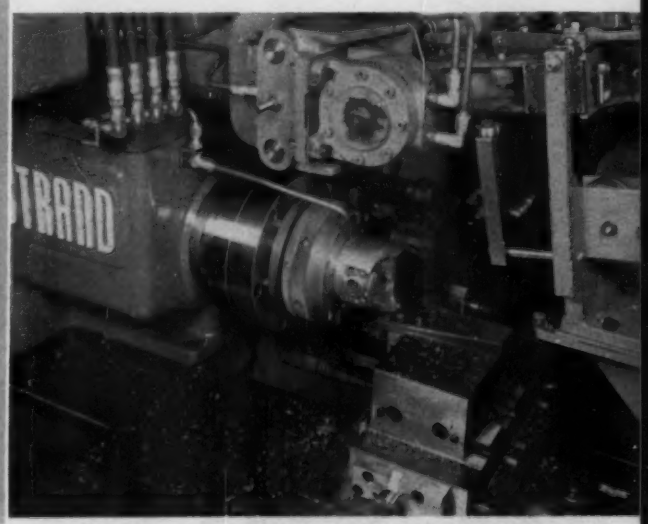
1. Shape, size, and weight.
2. Availability and position of previously-machined locating points.
3. Machine to be employed and operations to be performed.
4. Space available on and around the machine for mounting handling equipment.
5. Position of the part as it is delivered to the machine.
6. Required position of the part leaving the machine.
7. Necessary interlocking and timing of loading and unloading devices with other machine functions.
8. Necessary interlocking and timing of the machine and its parts-handling devices with connecting conveyors and other equipment.





center. Head indexes 180°, moves left to position work on headstock work driver, and holds work with center for turning and grooving operations. Reversed center and fingers drop machined piston into unloading tray just right of head





to synchronize arm motions to 1) pick up machined piston from chuck, 2) pick up blank from loading conveyor, 3) drop machined piston onto unload conveyor, and 4) place piston blank in headstock chuck

9. Production rate required, and total annual production schedule.

10. Cost of the installation.

11. Possible reduction in cost per piece and expected over-all savings during anticipated life of the installation.

12. Ease of converting the machine to other production operations, with or without conversion of the automatic parts-handling equipment, when product design or processing changes.

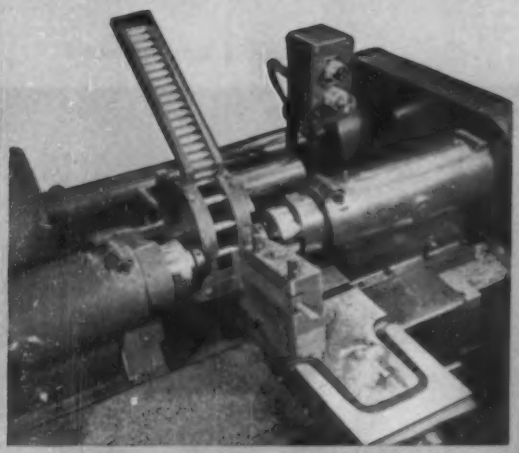
Automatic part handling can be tied in with automatic gaging to (1) stop the machining unit when a critical dimension is not within tolerance limits, or (2) automatically adjust and/or index tools to maintain production of acceptable parts for long periods of time (*AM*—Mar 14 '55, p117), and should be considered when studying the economic feasibility of handling parts automatically to and from production units.

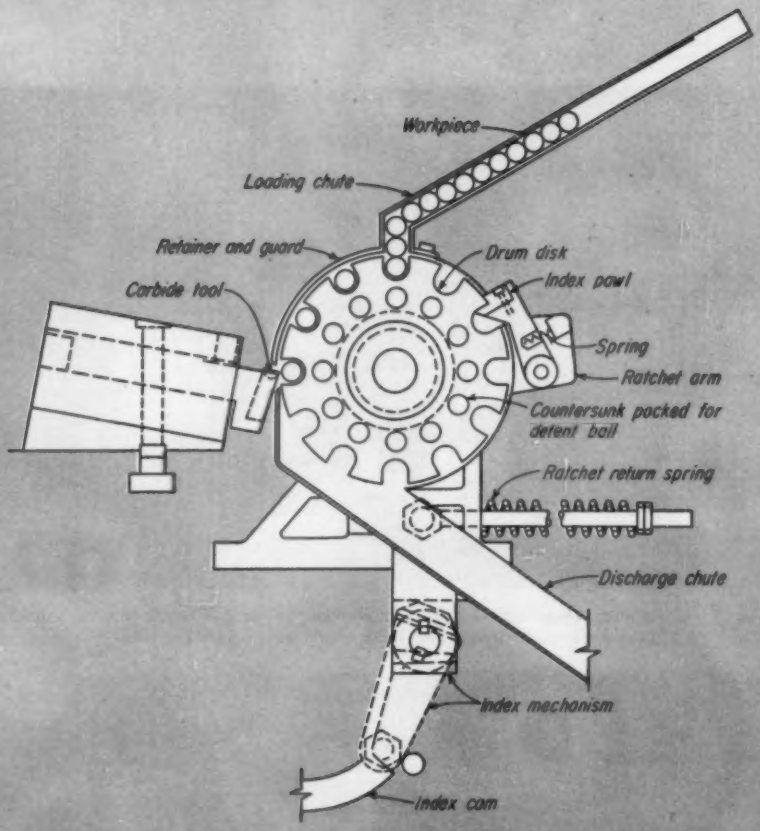
Automatic loading and unloading devices have been applied to a variety of horizontal and vertical automatic lathes—some operate from manually-filled hoppers, others from conveyors that move workpieces successively from machine to machine. Both types are shown and described among the following examples—all of which were developed by Sundstrand Machine Tool to help solve customers' problems.

Loaders and unloaders for automatic lathes can be grouped into three broad classes: (1) those with hoppers and/or chutes that deliver workpieces to the loading devices, and chutes for unloading the parts, (2) those which move the parts axially through the lathe spindle, and (3) those with overhead, power-actuated grabs. The third class generally is used only for larger parts, which are difficult to move satisfactorily along chutes or guide rails or must be positioned carefully for handling and unloading.

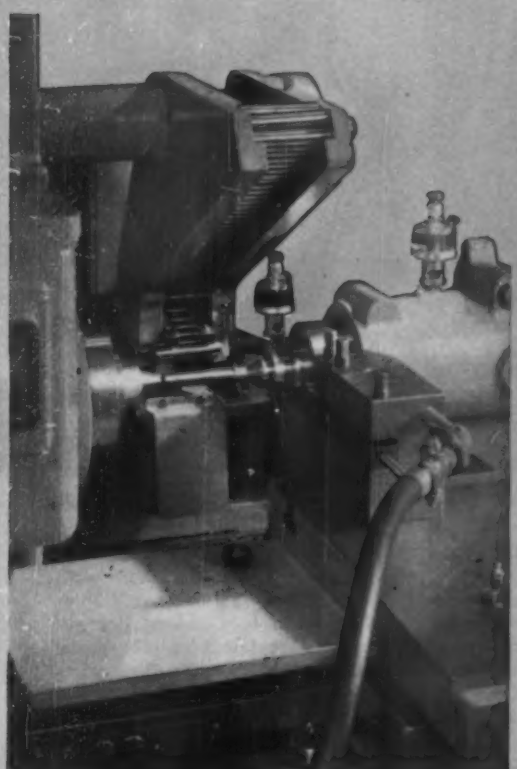
Hoppers and Chutes For Flexibility

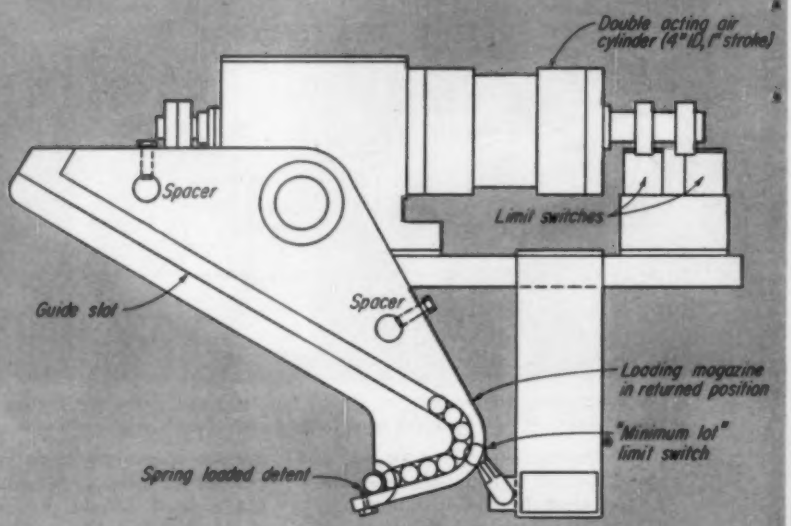
Parts ranging from small pins and bushings to large rings, gear blanks,

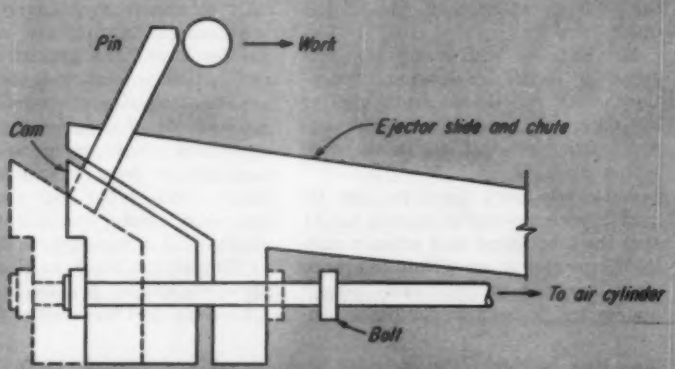




4. **Drum feed on double-end lathe.** Chute feeds CI valve-guide bushings to drum, which cycles with dual centers that grip the work as toolslide starts feeding. Machined parts fall free of open-end drum slots next time drum indexes. Drum side plates, chute rails, and toolslide can easily be changed for parts of slightly different size







5. **Pivoting magazine feeds tubes.** Track mounted over headstock swings down to lathe centerline, then tailstock center is powered to push titanium or stainless spacer tube onto head center. Magazine swings back out of the way, releasing work through spring detents. Ejector slide is powered forward and up after machining is complete. As air cylinder immediately starts to retract, cam raises ejector pin which flips finished work down discharge chute

pistons, and motor frames economically have been moved automatically with hoppers and chutes. Even rotor and stator lamination assemblies for electric motors are being moved into and out of automatic lathes for turning and boring.

As shown in accompanying illustrations, hoppers, chutes, and loaders for automatic lathes can have many design variations, depending on the parts to be handled and the ingenuity of the designer.

Handling of rolled and welded steel starter-ring-gear blanks for an automatic automobile transmission for automatic turning and boring operations presented difficulties until a novel tilting loader (1—photos and sketch) fed from a manually loaded hopper was developed.

Separate lathes are equipped with loaders and 17-in.-OD air-actuated diaphragm chucks for the boring and turning operations. In each case, the tilting loader moves horizontally under a stack of blanks in a hopper to grip the bottom blank in three jaws, then slide it forward and turn it upward for loading on the lathe chuck. As the loader, now in a vertical position, moves close to the chuck, it positions a chute section under the chuck to catch the previously machined part as it is ejected by three spring-loaded pins equally spaced around the periphery of the chuck. This discharges the machined part to the rear of the lathe, and clears the chuck for the incoming blank.

Up to 40 of the 15-in.-OD, 14-in. ID, ⅜-in.-thick ring blanks can be stacked in the hopper above the loader slide. The blanks in the hopper are supported by a horizontal plate on top of the loader carriage until the carriage is moved back to permit a blank to drop into the jaws of the loader.

Whether set up for turning or boring the ring-gear blanks, the No. 62 automatic lathe used for these operations is tooled with cemented carbide bits to remove approx 1/16 in. of stock at 254 rpm and 0.0114-ipr feed. Machining requires 0.44 min cycle time, loading and unloading is accomplished in 0.07 min, making floor-to-floor time 0.51 min for either operation.

Indexing Loader Handles Pistons

Cast-aluminum automotive-engine pistons are loaded manually into a chute at the rear end of a 6A x 24-in. automatic lathe specially tooled for turning and grooving operations (2—photos and sketch). From there on, all handling is automatic.

Duplicate sets of loading fingers and ball-bearing centers are provided in the outer ends of tailstock spindles extending from opposite sides of an indexable head on the rear slide of this lathe. The tailstock head alternately is indexed 180° right and left between machining cycles to transfer machined pistons to an unloading tray and to move rough blanks from the loading chute to a driver on the machine spindle. Production averages three 3½-in.-dia pistons per minute.

As the tailstock slide moves forward, after indexing, the forward tailstock spindle enters a 6-in.-long steadyrest bearing that rigidly supports the tailstock center against side thrust imposed by grooving tools on the rear slide. This bearing is split longitudinally in the top surface, so a clamp can close it tightly around the forward tailstock spindle during the machining cycle.

While the forward tailstock spindle loads a blank piston onto the spindle driver, the machined piston just indexed out of the forward position drops into an unloading tray bolted to the rear of the tailstock slide, clearing the loading fingers so they can pick up the next blank.

Upon completion of a machining cycle, limit switches cause the tailstock slide to return. This (1) moves the rear tailstock spindle into the bottom of the loading chute, where its loading fingers grasp the next piston blank, (2) moves the unloading tray against a stop that opens a gate and permits the previously machined piston to roll down a discharge chute, and (3) strips the machined piston from the driver on the lathe spindle nose.

Stops actuated by an air cylinder control movement of piston blanks down the loading chute, so stacked blanks are held away from the bottom blank in the loading position, permitting easy extraction of the blank by the loading fingers as the tailstock slide again is moved forward. Indexing of the tailstock spindles takes place as the supporting slide moves forward to load the blank on the spindle driver.

Rotary hydraulic pistons swing loading and unloading arms up and down between the lathe spindle and incoming and discharge gravity roller conveyors on each of a group of 12 special 6A x 24-in. automatic lathes that turn the skirt ends of 4-in.-OD cast-aluminum pistons for an automotive engine (3). These lathes are served by a system of drag-chain conveyor lines that insures continuous operation without expensive trucking of parts to and from the group.

Machined pistons from each lathe pass through an automatic gaging unit with feedback control of the lathe. If discharged workpieces from any of the 12 lathes do not meet tolerance specifications, that machine is stopped until adjustments are made.

On each lathe, a loading and an unloading arm are mounted on a cross-slide above the headstock. This slide is traversed horizontally to align successively (1) the unloading arm first with the lathe spindle, then with the discharge conveyor, and (2) the loading arm first with the loading conveyor, then with the machine spindle. While the loading arm is picking up a rough blank from the incoming conveyor, the unloading arm is removing a machined piston from the spindle chuck. Then the arms index, the loading slide moves laterally, and the loading arm places a blank in the chuck while the unloading arm places the machined piston on the discharge conveyor.

Escapement arms in the loading conveyor, actuated by a lever contacted by the loading arm, control movement of incoming blanks one at a time to the pickup station.

Each lathe operates independently of the other lathes in the group, and is cycled to machine three pistons per minute. Production requirements govern the number of machines scheduled to run.

Along each side of the group's central conveyor system piston blanks automatically are shunted to loading conveyors of the individual lathes only when those conveyors are emptying and thus are actuating gates which move blank pistons off the constantly-moving central conveyor systems.

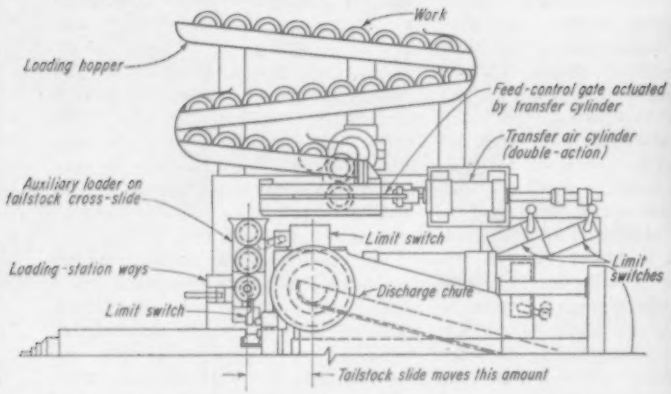
Machined and gaged pistons are discharged to stub conveyor lines for spot inspections, when considered necessary, or are shunted directly to unloading drag-chain conveyors (lower level).

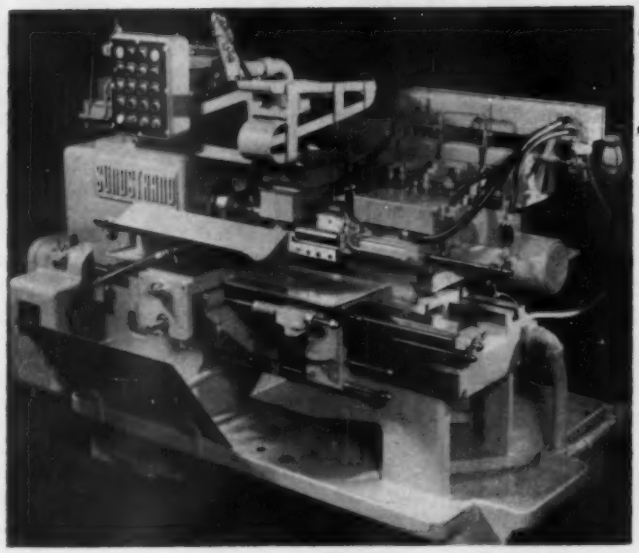
Chute-Loaded Bushing Lathe

Special double-end lathe developed for turning the OD of CI valve guide bushings (4) is chute loaded, and has a slotted drum that carries the parts to and from the machining position.

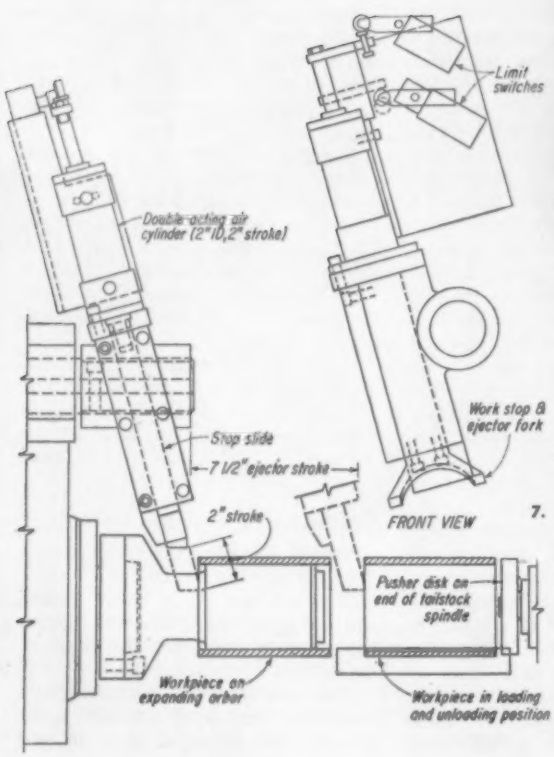
The two opposed spindles turn constantly and automatically move toward each other to pick up and

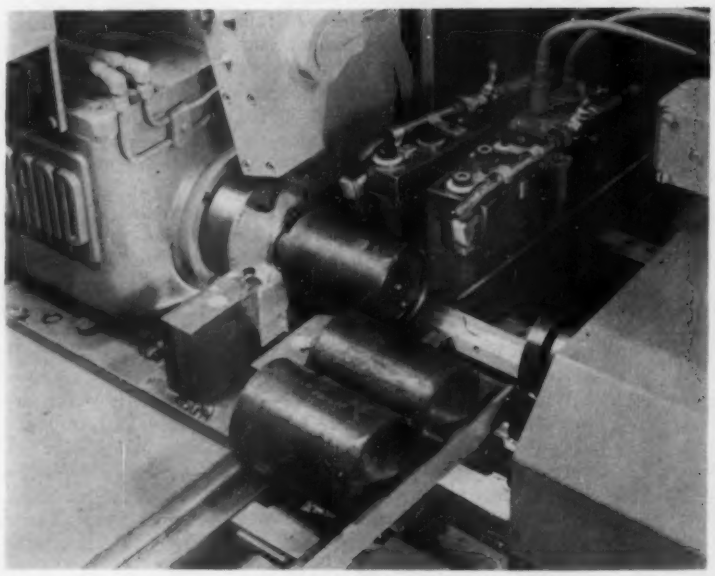
Loaders and Unloaders . . .



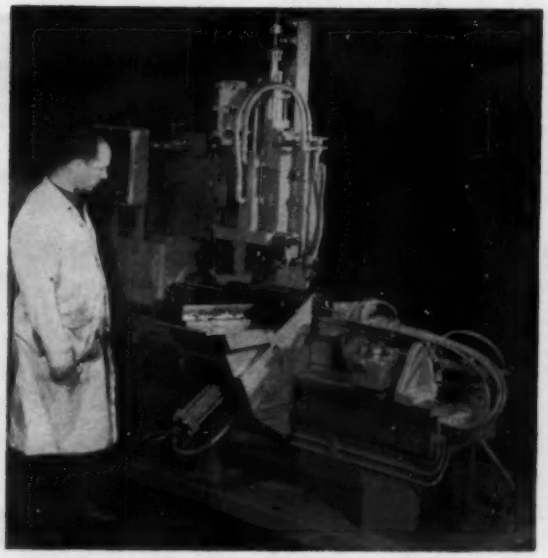


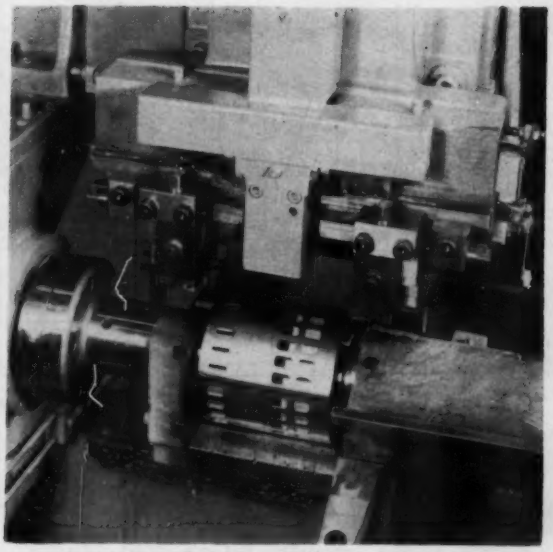
6. Triple transfer places bushings. S-chutes feed cylindrical parts to a feed-control gate, which drops them into auxiliary magazine, which deposits them on ways in front of a pusher cylinder. Tailstock slide moves side to side; to rear to line up ways with headstock mandrel so air cylinder can push work onto mandrel against combined stop and ejector, and to front to position tailstock center that holds work for machining. Machined parts are ejected to gravity chute


Limit switches
Double-acting air cylinder (2" ID, 2" stroke)
Work stop & ejector fork
Stop slide
7 1/2" ejector stroke
2" stroke
FRONT VIEW
Pusher disk on end of tailstock spindle
Workpiece on expanding arbor
Workpiece in loading and unloading position



7. Powered stop ejects parts. Horizontal and vertical air cylinders mounted over lathe headstock power a forked work stop. Vertical cylinder moves it down to act as a stop as auto generator frames are pushed onto mandrel by tailstock cylinder. Forked stop retracts during machining, then comes down again, and is moved toward tailstock by horizontal air cylinder to strip work from mandrel and drop it into discharge rails. Air-powered lever arrangement stops new parts on loading rails and lifts one part to loading way in front of pusher piston





9. Motor frames handled by slide. Retracting pins in loading chute let one part drop at a time into a pocket, from which it is lifted by air cylinder onto a way-mounted slide. Parts are pushed onto headstock mandrel by the slide, then stripped by the slide after machining. Hardened wear strips in slide reduce replacement problems

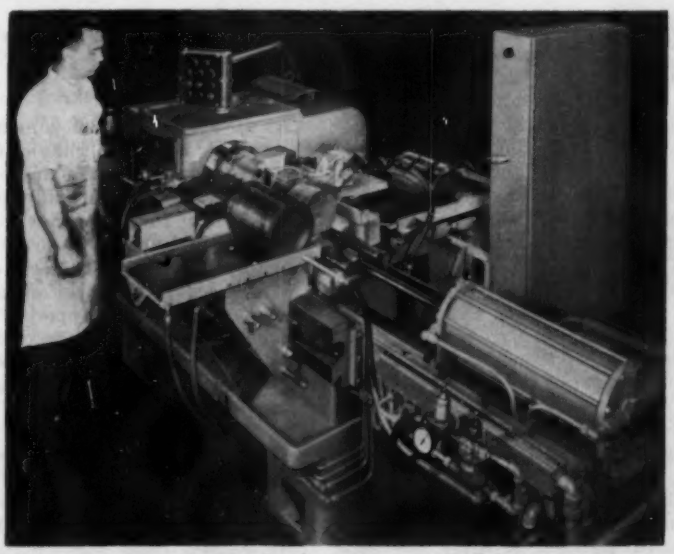
drive the workpieces between serrated centers. After the feed chute has been filled and the machine started, it automatically goes through the following movements for each machining cycle:

A bushing is brought into place by the automatically-indexed drum, and the two revolving centers are advanced with enough pressure to drive the part from both ends. As soon as the centers are positioned, the toolslide, which carries a single carbide-tipped tool, rapid-approaches the work and feeds across to make a single cut.

When the cut is completed, the tool is relieved 1/16 in. and rapidly returns to the starting position. As the tool returns, the centers retract and the loader drum indexes another position — allowing the machined bushing to drop into a discharge chute and, at the same time, bringing the next blank into position for turning. A cycle is completed every 3.5 sec, resulting in a production of approx 1028 pieces per hour at 100% efficiency.

This machine easily can be adapted for a range of bushing sizes by (1) changing drum end plates and chute side rails when setting up for bushings of different diameters, (2) providing for axial adjustment of drum plates and chute side rails so setups can be changed for bushings of different lengths, and (3) providing adjustments in toolslide movements.

Indexing of the loading drum and movement of the spindles is timed with the cycle of the front slide by means of cams mounted on a shaft in the base of the machine. One 5-hp motor drives both spindles, the cam shaft and the toolslide.



8. Carriage mounts large parts. CI diesel-engine pistons feed from a chute to a way-mounted carriage powered by large air cylinder that pushes parts onto headstock mandrel. Air-operated pins, set at a slant in top of load chute, both stop incoming part and push one part onto transporting carriage. After machining, carriage retracts to line up with loading chute, and incoming new part pushes machined part to unload chute at rear of lathe bed

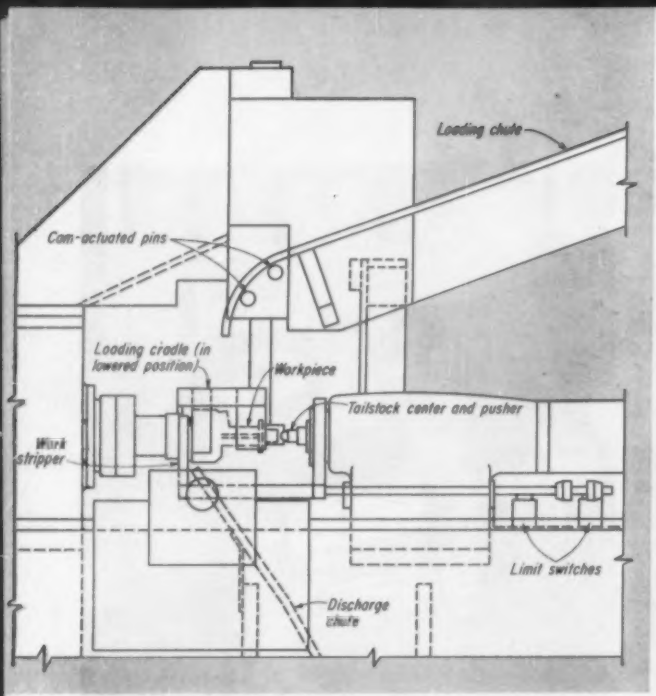
Pivoted Magazine

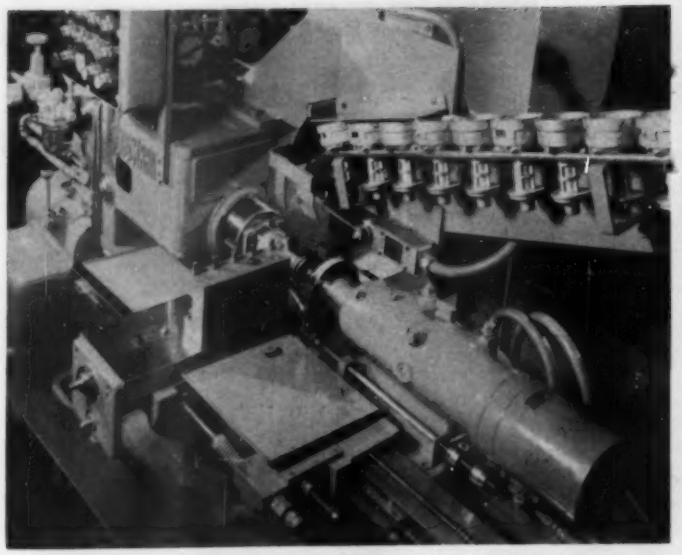
Air cylinders controlled by limit switches and solenoid valves load and unload compressor rotor disk spacing tubes in a 6A x 24-in. automatic lathe (5) which requires no attention from the operator except to keep the magazine chute filled and to inspect the tool.

Both the loader and the unloader on this lathe are adjustable to handle ⅝-in.-OD, 3/32-in.-wall tubes ranging in length from 2 to 5 in.

Overall cycle times for stainless-steel tubes 2 in. long average 0.34 min each. Titanium tubes 2 13/16 in. long are machined in 0.61-min cycles.

Actuating mechanism for the





10. **Cradle lowers work from conveyor.** Die castings feed down two steel rails to stop pins, which release only one part as cradle is raised by air cylinder. Cradle drops down to line up part with headstock mandrel, then tailstock cylinder pushes part onto mandrel. Work stripper connected to tailstock mechanism pulls machined part off as it goes back

pivoted magazine is mounted on top of the lathe headstock, and the magazine chute is positioned so its inboard side always is in line with the center in the lathe spindle nose. Only the outboard side of the magazine, the tailstock position, and the cycling of the turning tool need be adjusted when changing setups for different lengths.

Controls for the loading and unloading mechanisms are interlocked so these mechanisms will operate in a timed sequence so they will not interfere while unloading a machined part and positioning the next.

When the work area has been cleared of the previously-machined part, the loader is swung forward to position the incoming workpiece between headstock and tailstock centers, and the tailstock center is moved forward to drive the tube onto the constantly-turning, serrated headstock center. The loader then is retracted, spring-loaded detents in each arm being depressed to clear the loaded workpiece.

A limit switch in back of the loader prevents its actuation unless there are at least six parts in the chute—which has capacity for 30.

Retracted during the loading and machining portions of the cycle, the unloader, mounted in a tilted position at the rear of the lathe, is advanced automatically as the front toolslide is returned upon completion of a cut. At the end of its forward stroke, the unloader immediately is returned. This raises on a cam the ejector pin and causes it to flip the machined workpiece into the discharge chute.

Cross-Slide on Tailstock

An air-actuated loader is mounted beside the tailstock spindle on a 6A x 24-in. automatic lathe (6) specially tooled for turning the OD of SAE 1010 steel bushings 1 5/16 to 2⅛ in. OD and 3⅝ to 5¼ in. long. Cycles average 36½ sec each.

Workpieces are loaded manually to an S-shaped chute supported from the headstock of the lathe, and are dropped one-at-a-time into an auxiliary loading chute on the tailstock cross-slide by an air-actuated gate. This second chute deposits the workpieces on the ways of a loading station in front of the pusher.

When the tailstock spindle has been withdrawn and a machined part ejected from the expandable arbor on the spindle nose, the tailstock cross-slide is moved laterally to the rear of the lathe. Automatically, the next part is pushed onto the arbor, against the combination stop and ejector. The stop then is lifted to clear the work for the machining cycle, and the loader is withdrawn to permit recentering the tailstock with the arbor.

Upon completion of a machining cycle, the stop slide again is lowered as the tailstock spindle is withdrawn, and the ejector slide moves forward to strip the finished part from the arbor and drop it into the discharge chute. Return of the ejector slide positions the stop for loading the next piece.

Within limits of its capacity, the chutes and loader mechanism on this lathe need not be readjusted when setting up for parts of different lengths. Only the strokes of the ejector and pusher cylinders need be changed.

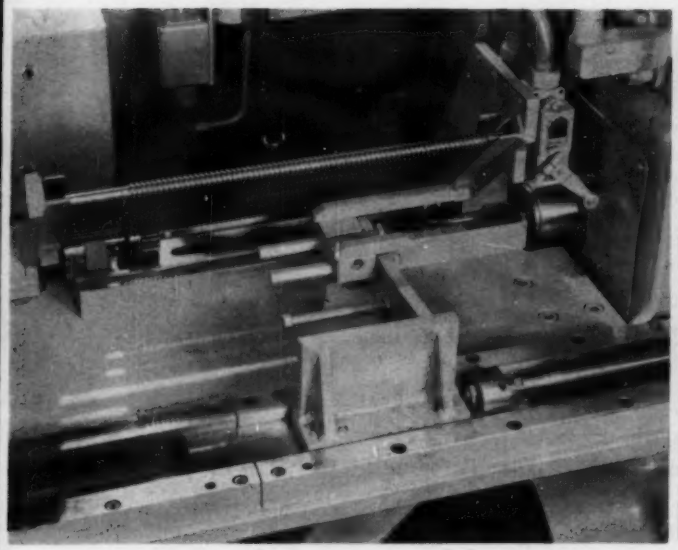
Between-Ways Loader

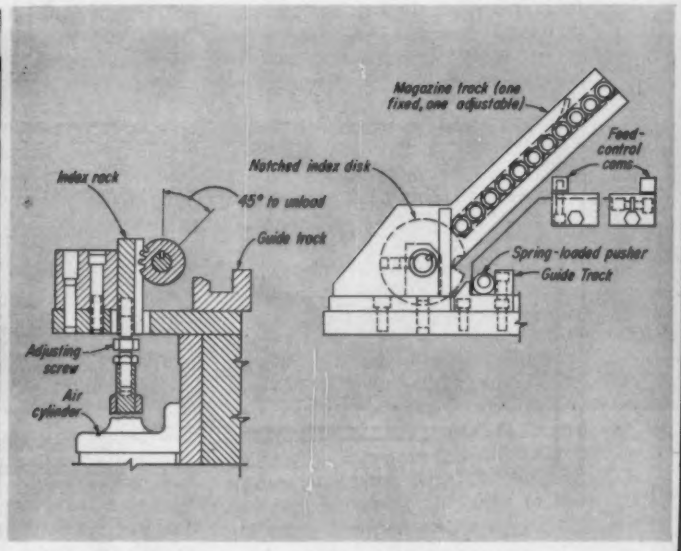
Rolled steel frames for automobile generators are faced and chamfered at both ends in 0.32 sec each, floor-to-floor time, with a simply-tooled 6A x 24-in. automatic lathe (7). Chute rails carry the workpieces to and from the lathe, where a between-ways, air-actuated transfer mechanism lifts the parts into and out of alignment with the expandable arbor on the spindle.

A pusher disk on the end of the tailstock spindle moves a new part onto the arbor, after a machined workpiece has been ejected and moved to the discharge chute. An automatically - positioned combination stop and ejector mechanism, similar to the one on the bushing lathe, positions a part on the arbor as it is being loaded, and pushes the part off the arbor when it has been machined.

The combination stop and ejector consists of two air-actuated slides—one mounted horizontally on the headstock of the lathe, and the second mounted at a 15° angle from the vertical on the first, which carries the stop and ejector fork.

To push a part off the lathe's arbor, the stop slide moves down to position the fork behind the work-





11. **Ball screws feed through spindle.** Magazine feeds ball screws down to a pair of notched indexing disks, which dump a part at a time into a guide track. Parts are rammed through spindle by headstock-mounted air cylinder. Vertical air cylinder operates notched disks through rack and pinion. Parts are extracted at other end of spindle

piece, then the horizontal ejector slide moves forward to strip the part from the arbor. On the return of the ejector slide, the top slide is left down so the stop fork can position the next part as it is loaded onto the arbor, then it also is retracted to clear the work area for machining operations.

Other Chute-Type Loaders

An interesting variation in chute-loader design was used (**8**) to load CI diesel-engine pistons onto an expandable arbor in a 8A x 36-in. automatic lathe for turning and grooving operations. Air-actuated pins set at an angle in the loading chute serve both as retractable detents, to keep a line of workpieces from forcing the one to be loaded forward, and as pushers to move the next workpiece from the chute onto horizontal loading bars spaced between the ways of the lathe.

Large air cylinder, mounted at the end of the lathe ways, traverses a loading carriage along the loading bars—both to push the workpiece onto the expandable arbor, and to retract it when machining cuts have been completed. Movement of the next workpiece onto the loader pushes the machined part into the discharge chute. Production rate is too low to justify expensive conveyorized handling of these cylinders to and from the chutes. Instead, the parts are moved manually to and from adjacent lift platforms.

A variation of this idea appears in the loader and unloader on a 6A x 36-in. automatic lathe (**9**) that is tooled to face and chamfer the ends of rolled-and-welded steel motor frames. These 5½-in.-ID frames range from 3 to 9 in. long, so the loader has adjustable chute sides, and the loading slide moved by the tailstock is adjustable.

In this arrangement, parts loaded into the front chute drop one-at-a-time into a pocket from which they are lifted by an air-cyclinder-actuated slide into the loading slide —thereby pushing aside into a discharge chute at the rear of the lathe the previously-machined workpiece. Axial movement of the tailstock spindle traverses the loading slide onto an expandable arbor in the machining position. Hardened wear inserts in all faces of the loading slide locate the part on the arbor, then later serve to strip it from the arbor for ejection. Functions of the machine, loader, and slide are interlocked through limit switches to insure trouble-free automatic cycling so long as the loading chute is kept filled.

Several interesting handling features are incorporated in the tooling on a 4A x 24-in. automatic lathe that turns, faces, and grooves die-cast aluminum-alloy housings for automotive distributors (**10**).

Loading and discharge chutes are ½-in.-dia steel rods spaced far enough apart on steel brackets to permit the castings to hang and slide on their heads. At the lower end of the loading chute two spacing pins, moved by cams cut in rods supporting the loading cradle, permit a workpiece to drop horizontally into the cradle each time it is raised by a vertical air cylinder.

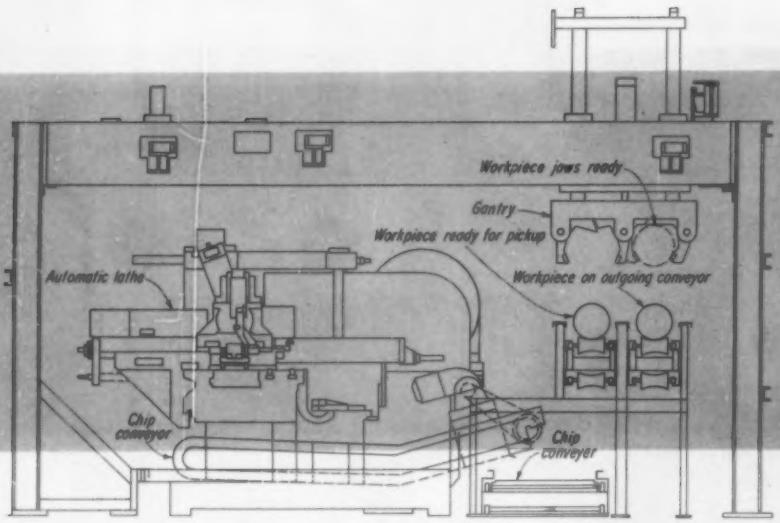
During the loading cycle, the loaded cradle is lowered to align a workpiece with the arbor on the spindle nose of the lathe. At this point, the tailstock spindle is moved forward to push the large end of the workpiece onto the arbor, and to center the small end. When the air cylinder at the other end of the lathe spindle has expanded the arbor to grip the large end of the workpiece, the loading cradle is returned upward and the lathe is cycled to machine the part. When the spindle is stopped at the end of the machining cycle, return of the tailstock spindle strips the machined workpiece from the arbor and drops it into the chute.

Floor-to-floor time for this operation averages 9 sec, of which 5 sec are machining cycle, and 4 sec loading and unloading.

Through-Spindle Loaders

Modifications of bar-stock feeder designs for through-spindle loading of individual parts have been employed for years to increase the production efficiencies of lathe operations. A typical arrangement is the one shown (**11**) for finish form turning and chamfering the outboard bearing ends of ball screws.

This feeder is adjustable to feed 0.600-in.-OD screws ranging from 6⅞ to 18 in. in length. It has two slotted feed disks, powered through



12.

Gantry positions large parts. Across-the-ways gantry picks up large hollow cylindrical parts from roller conveyor and loads them in automatic lathe (usually one of several in a line). Part is placed on powered loader-unloader on lathe bed. When work is mounted on mandrel, loader carriage swings out of the way so tailstock center can contact work. Double grabs allow gantry to bring new part to lathe and return machined part to conveyor in one trip

a rack and pinion by a vertical 2-in.-bore, ½-in.-stroke air cylinder, to move the workpieces one at a time into a feed track, and a longitudinal feed slide to push them into a guide tube inside the hollow lathe spindle. Stroke of the 1½-in.-bore, 24-in.-stroke air cylinder that moves the feed slide is controlled by limit switches and cam bars.

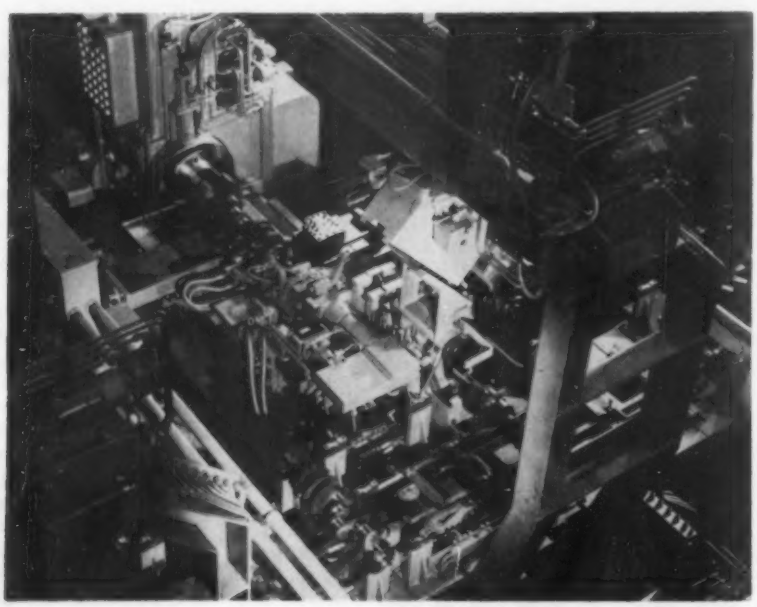
Feeding always is from the outer end of the guide track, the inner track and slotted disk of the manually-loaded magazine being adjustably positioned along the baseplate of the feeder to suit screws of different lengths. Each workpiece is pushed through the lathe spindle and collet chuck against a positive stop for accurate positioning of the bearing end with relation to tools on front and rear slides.

An extraction mechanism (not shown) is mounted at the other end of the lathe to pull finished screws out of the chuck while the next screw is fed in from the other end.

In another setup (not shown), a commercial bar feeder arranged to handle 16-ft mill lengths of ⅝-in. round bars is connected to the headstock of a 6A x 24-in. automatic lathe for continuous machining of 8 to 13 in. electric motor shafts. Cycle time is 7½ sec for any shaft length within this range, and the hopper-fed stock feeder operates automatically to maintain a continuous flow of bar stock through the machine spindle which is not stopped so long as tools continue to cut satisfactorily.

The stock is fed axially through the lathe spindle and into two collet chucks, one on the lathe spindle nose and the other in a rotating steadyrest, which is straddled by tools on the front and vertical lathe slides. The motor shaft is formed at the outer end, grooved in two places for lamination locking washers, chamfered and cut off, hence the need for a steadyrest.

Of special interest is the unloader mounted between the ways at the tailstock end of this shaft lathe. It pulls the finished shaft from the



13.

Walking-beam conveyors move crankshafts. Automatic crankshaft-machining line is served by walking-beam conveyor that continuously picks up parts from pedestals and indexes them one pedestal down the line (to lower left in photo). Gantry cranes over each machine pick up parts from pedestals and place them in lathe, then return them after main and crank bearings have been machined

steadyrest, and drops it into a gravity roller conveyor, while the stock feeder at the other end of the lathe is working.

The unloader consists principally of a limit switch and cam controlled 2-in.-bore, 10-in.-stroke horizontal air cylinder with piston rods extending from both ends. Piston rod on lathe end of the piston carries a stripper head with spring fingers to grasp and pull a finished shaft from the steadyrest—the rod on the other end moves a cam plate to trip limit switches controlling piston strokes.

Gantry-Supported Loaders

Automatically controlled loaders and unloaders suspended from gantry rails move large, relatively heavy workpieces, such as railroad-car axles, high-explosive shell bodies, auto engine crankshafts and camshafts, etc, between lathe-mounted loaders and adjacent conveyor lines—when work volume is high.

Several gantry-loader designs have been used successfully to handle parts to and from groups of lathes aligned with connecting conveyors to perform successive operations on different workpieces, or to increase the efficiency of individual lathe operations.

Gantry tracks can be positioned across lathe beds and parallel conveyors (**12**) or in line with lathe bed ways and across conveyors placed at right angles with the lathes, with equal handling efficiency.

The first arrangement shown (**12**) has across-the-ways gantrys that load and unload relatively large hollow cylindrical-steel forgings successively into three large Model 16A automatic lathes aligned end-to-end. Tailstock carriage of each lathe has a cross-slide to alternately align a power loader-unloader and the tailstock spindle with the expanding arbor on the lathe spindle. Work transfer units, suspended from the gantry rails, each have pairs of grab fingers placed side-by-side, so two workpieces can be handled.

This makes it possible to: (1) move the carriage from the conveyor station to the lathe with a rough part in one pair of jaws, and with the other pair open; (2) position the loader carriage, lower the loader head, and pick up a previously machined part from the lathe; (3) reposition the carriage above the lathe, lower the loader head, and deliver the incoming rough part; (4) raise the loader head, return the carriage to the conveyor station, and lower the head to deposit the machined part on the outgoing conveyor line while picking up the next rough part from the adjacent incoming conveyor.

Such an arrangement usually is necessary when the parts to be moved are relatively large and heavy, but involves use of two conveyor lines. Other loader designs (**13**) permit interchanging loaded and open pairs of grab jaws above lathe or conveyor positions without having to raise the loader head, reposition the supporting carriage, and relower the loader head to exchange workpieces either at the lathe or at the conveyor—and permit use of the same conveyor line for incoming and outgoing parts.

For safety, in almost every case cam-actuated lock pins hold the loader assemblies in their elevated positions, except when the loader is aligned directly above workpiece transfer stations, and limit switches prevent movement of supporting carriages along horizontal gantry rails unless loaders are raised and the lock pins are in place. This insures against interference between machined parts and loads.

One of the largest workpiece loader-unloader units now in use on an automatic lathe (**14**) moves railroad locomotive axle forgings (4 to 12 in. in dia and 6 to 9 ft long) to and from a 300-hp tracer-controlled lathe for complete rough turning in a single operation. With this unit, a forging can be interchanged in less than 0.50 min.

Lifter Assemblies

The loader-unloader consists of an overhead gantry, on whose 4-wheel carriage are mounted two independently-controlled lifter assemblies—one for transferring rough milled-to-length and centered forgings from a loading elevator, the other for moving turned axles from the lathe to an unloader which delivers them to discharge rails.

At the loading end of the gantry, a 46-in.-stroke horizontal hydraulic cylinder pushes the elevated forging against a positioning stop before it is picked up by the loader, so its forward end will be aligned with the work driver on the lathe spindle when transferred into the lathe.

Similarly, at the other end of the gantry frame a positioning cylinder locates the turned axle longitudinally in line with discharge rails before the unloader arm assembly is actuated. Fingers on the unloading arm extend between supporting rollers onto which the axle is deposited by the overhead unloader assembly, so they lift the axle from the rollers as a 26-in.-stroke cylinder swings the unloader-arm assembly through 90° to roll the turned axle onto the rails.

Pickup and discharge stations are spaced 114 in. to either side of the lathe axis, and the loading and unloading lifter-arm assemblies carried by the overhead carriage are spaced 114 in. apart. Thus, when the carriage is moved to the left the lifters are spotted to pick up a forging from the loading elevator, and to pick up the rough-turned axle from the lathe. When both lifters have been raised, the gantry carriage automatically is traversed 114 in. to the right, locating the lifters for loading the lathe with the forging, and for delivering the axle to the unloading mechanism.

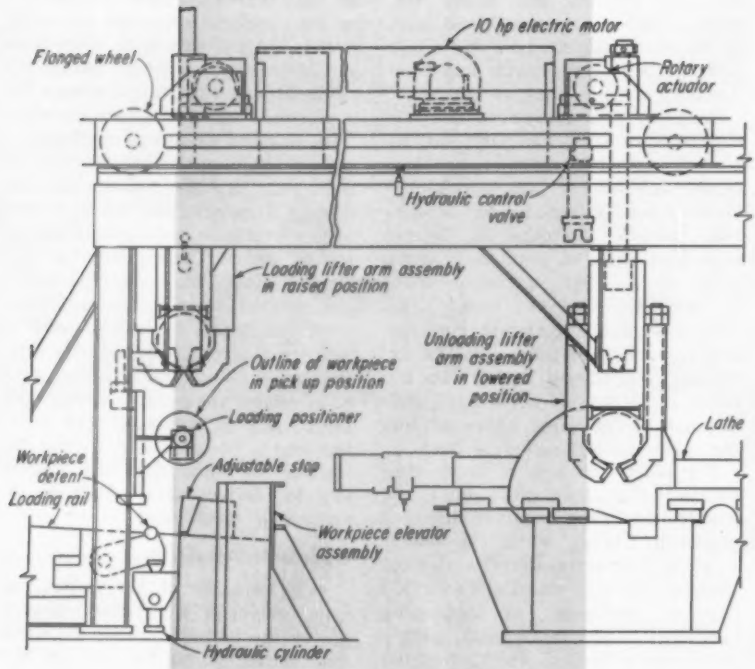
Hydraulic Actuation

A 10-hp motor on the gantry carriage drives a hydraulic pump to power the cylinder which traverses the carriage along the gantry rails and the two hydraulic rotary actuators which raise and lower the lifter assemblies. A floor-mounted hydraulic pump powers the cylinders and rotary actuators which operate the workpiece detent and elevator at the loading end and the tilting unloader at the other end of the mechanism.

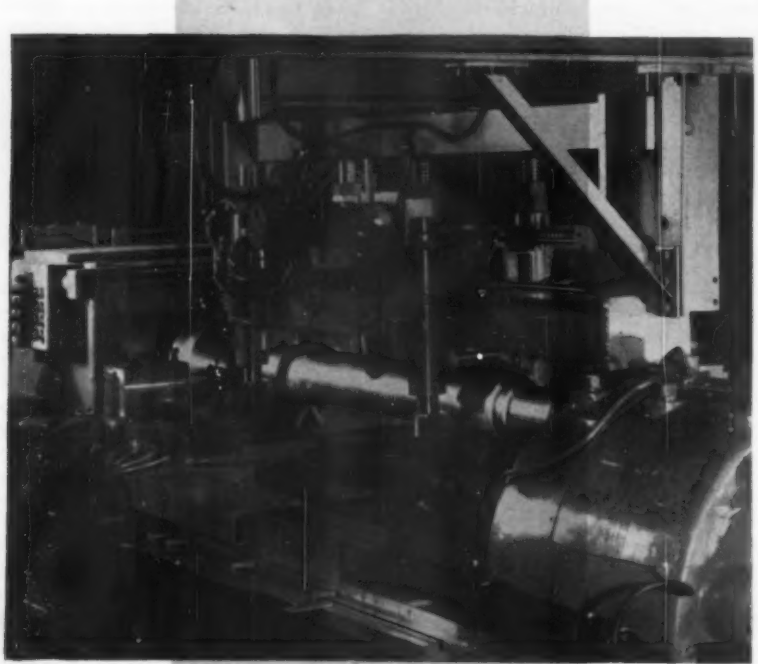
Two pairs of arms, each equipped with hardened steel rollers, are mounted on each of the two lifter assemblies. Spacing of these pairs of arms longitudinally along the lower rail of each lifter is accomplished manually with handwheels on long screws, to position the arms when resetting for workpieces of a different length. A ¾-hp geared-head electric motor turns the lifter arms 90° with worms and wormgear sectors on each lifter to open or close the arms under a workpiece.

Only cost of the installation limits the complications which can be incorporated into gantry carriage and loader designs. It is possible, for example, to arrange to turn a load end-for-end, or 90° to either side, or to turn the load over.

In almost every successful gantry loader in use today, loader heads close and open grab fingers automatically, permitting loads to be picked up and deposited without attention from machine operators or material move men. This arrangement necessitates, of course, precise location of workpieces under pickup positions both at the lathes and on the conveyors serving the lathes.



14. Gantry places axles in lathe. One of the largest work loaders applied to date moves 1800-lb steel railroad axle forgings into 300-hp tracer-controlled lathe. Gantry picks up axle at elevator, places it in lathe, then removes it to another pedestal unit that tilts under axle weight to gravity-feed the work onto a conveyor. Floor-to-floor time, in which 400 lb of chips have been removed, is 11 minutes



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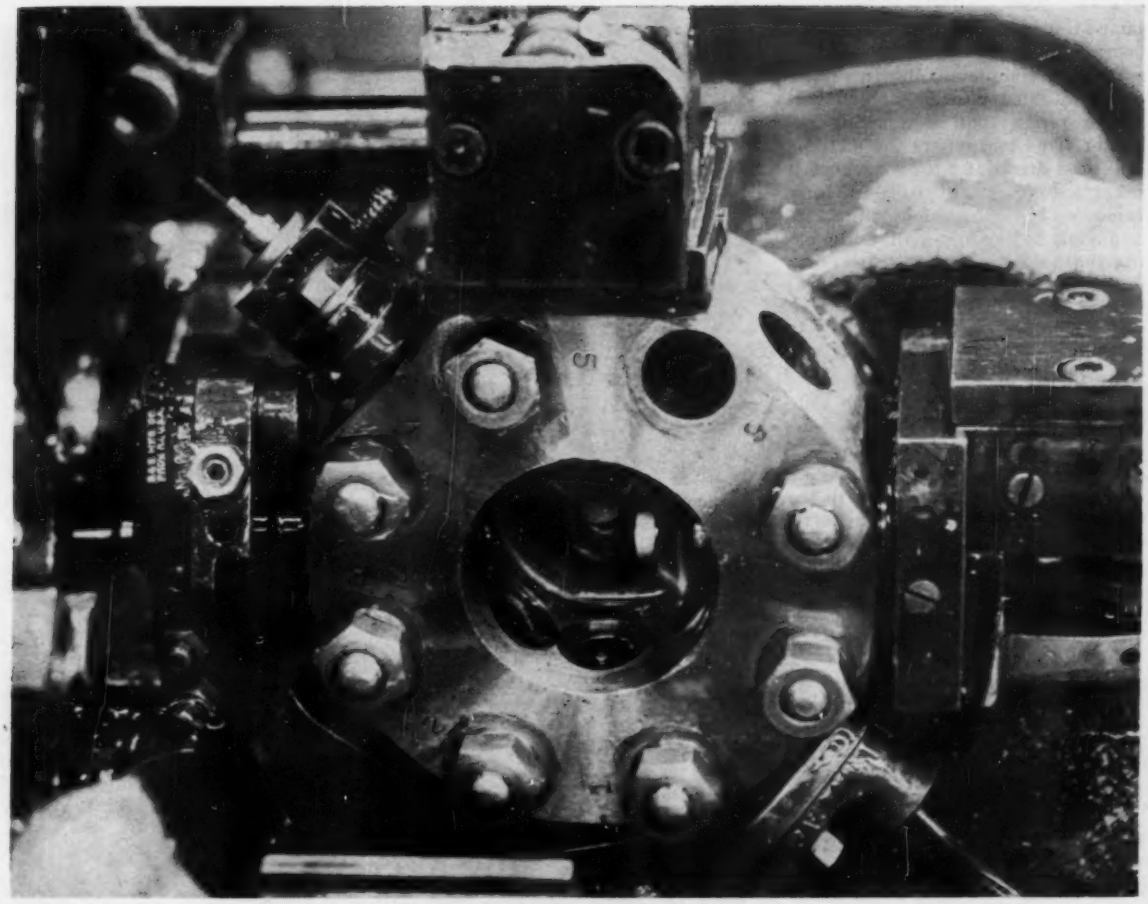


First milling attachment, mounted in fifth position of the turret (top of photo), produces a vertical slot. Second attachment, at Position 7, cuts a horizontal slot. Both attachments were modified slightly to clear the machine casting.

Simple attachments turn the trick as . . .

One screw machine does 12 jobs

By William Neubert, **manufacturing engineer**
Meter Division, Westinghouse Electric Corp, Newark, N J

Secondary screw machining operations on small, delicate parts are tricky at best, not so much because of the secondary operation itself, but because thin walls can easily be distorted, or soft material damaged as parts are transferred from one machine to another and set up.

Obviously, the best way to avoid part damage is to do both primary and secondary operations on the same machine—and that's where screw machine attachments come in.

This one-machine approach to complex screw machining jobs is really paying off at Westinghouse's Meter Division, Newark, N J. For instance, an upper bearing for a watthour meter undergoes roughly a dozen operations before it's ejected as a finished piece—but the work is all done on a single-spindle automatic equipped with special attachments fitted to the turret and deburring attachment.

The stock (in this case 0.172 in. dia soft aluminum rod) is fed through the headstock spindle to the machine's swing stop. Here the initial machining involves drilling a 0.116-in. hole to a depth of 0.180 in. Because concentricity depends on the drill's performance, only the shortest possible projection is allowed outside its bushing, which is mounted in a floating holder.

Thus, the 120° bottom made by the first drill serves as a perfect center for a 0.046-in. drill that follows in the second turret position. This drill penetrates 0.115 in. further for a total depth of 0.295 in. This produces a clean pilot hole for back counterbore once the piece has been severed. While drilling is in progress, carbide tools on the machine's front slides finish the 0.162 in., 0.140 in., and the 0.115 in. OD's and at the

same time face the front of the bearing.

Drilling completed, the turret indexes to third position, which carries a recess tool in a swing-tool holder. This tool enters the 0.116-in. hole to a depth of 0.102 in. where it takes a 0.003-in. cut, 0.080-in. long, removing the remainder of the 120° angle left by the first drill, and making the hole flat bottom.

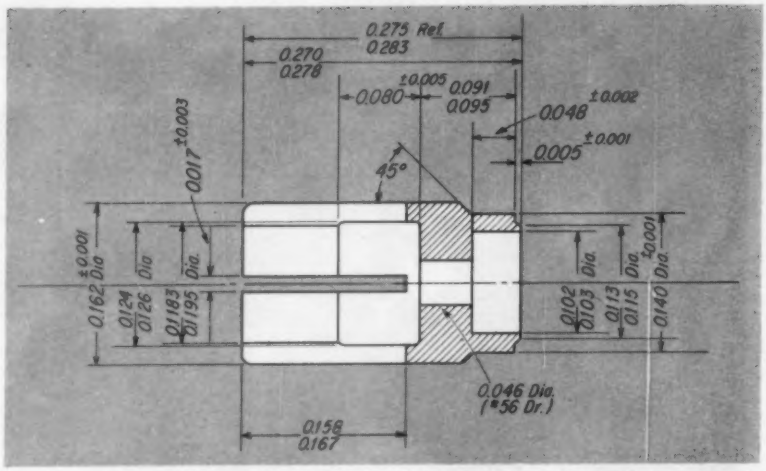
Another indexing brings the first milling attachment into position as the machine spindle is stopped. A 0.017-in. wide slitting saw, set vertically in the attachment, cuts a slot 0.158-0.167 in. deep. While the spindle is still stationary, the second milling attachment is brought into position with a double indexing. A horizontal slot of the same width and depth is then cut. The 6th turret position is left open to make room for the bevel-gear drives which power attachments.

Four slots are thus produced through the wall material precisely at 90° to each other. Burrs are left in the bore and on the OD, but they are easily taken care of by a carbide-boring tool in the eighth turret position. The outside burrs are removed by bringing the front slide back within 0.001 in. of the OD.

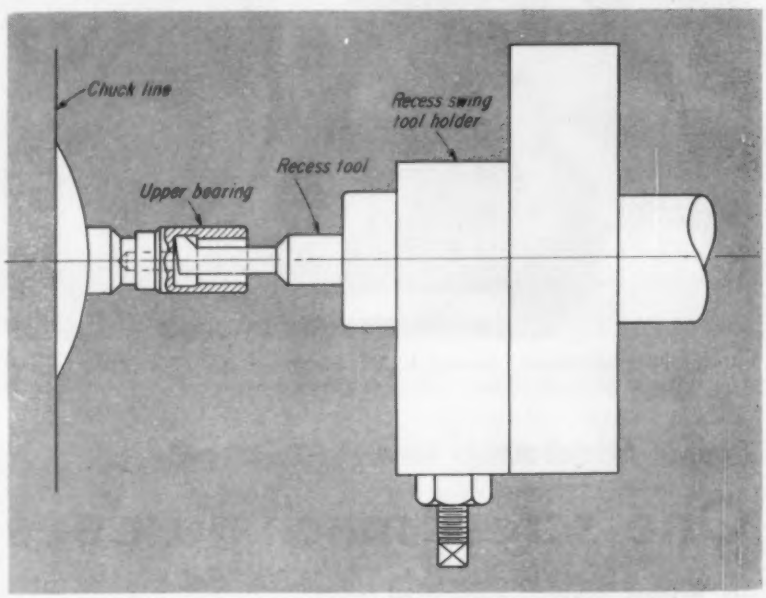
With the turret backed away, the pickup arm of a deburring attachment (mounted in place of a standard slotting attachment) swings in front of the piece. Because the finished wall is only 0.018 in. thick, it is not stable enough to be held with the usual collet.

Instead, a pickup pin, with a close fit in the bore of the piece, is set in a countersunk bore of a pickup bushing. Once this pin has entered the piece, a cutoff tool on the back slide severs it from the stock, after which it is transferred to the deburring attachment.

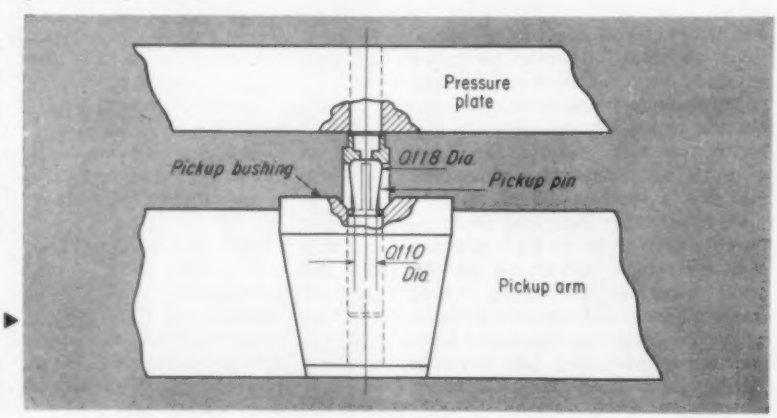
Here a pressure plate pushes the piece into the counterbore to close its wings tightly around the pin, setting the material to proper dimensions. A counterbore, mounted in the deburring attachment, then enters through a clearance hole in the pressure plate to bore the 0.102-0.103 in. back hole. A pilot on the counterbore guides it in the 0.046 in. hole during this operation. The backward movement of the pickup arm ejects the finished piece from the pin.



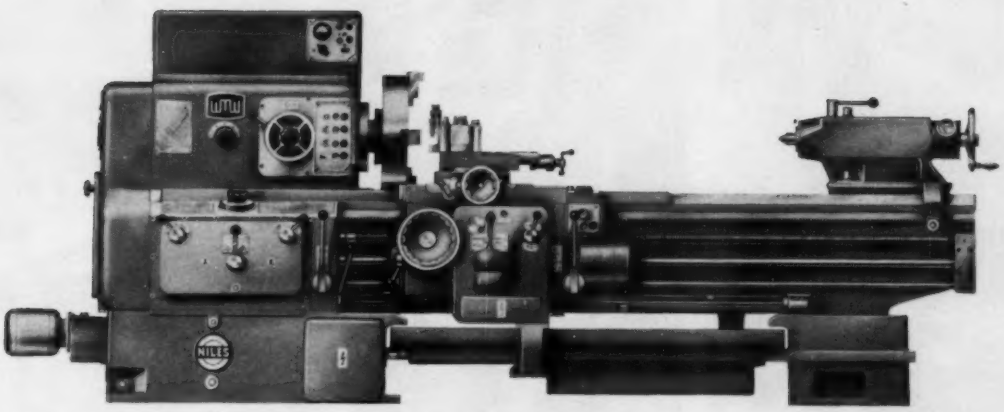
Sectional of upper bearing shows its vulnerability to damage in transit to a second machine. Westinghouse has found elimination of such between-machine handling cuts rejects to a minimum, lowers production costs



Recess boring tool mounts in a swing-tool holder in the third position of the turret. Guide plate fitted to the front slide controls the depth of cut, while a lead cam governs longitudinal travel



Pressure plate holds part firmly on pickup pin while back recess is counterbored. As pressure is applied, the wings are forced into the bushing's countersink, gripping the pin as a chuck does

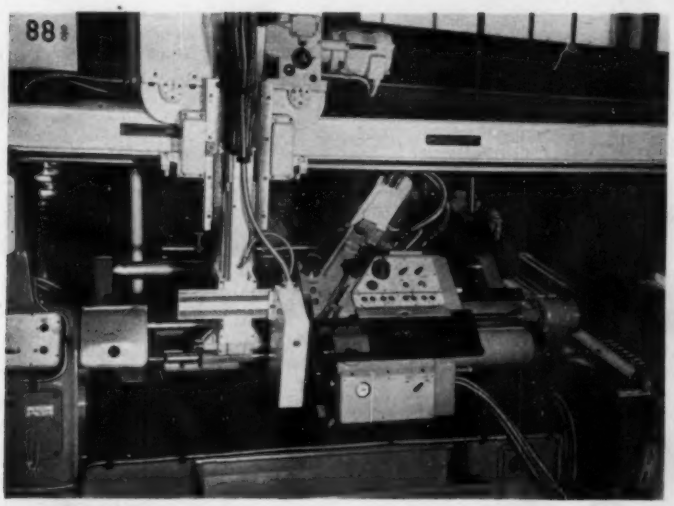


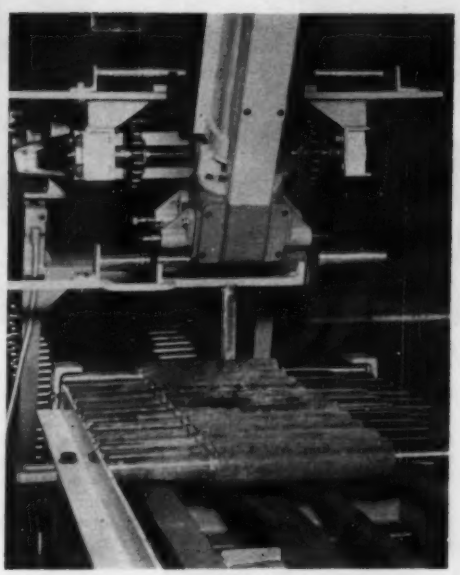
New range of building-block center lathes . . .
This is just one configuration of a new range of East German-built building-block center lathes—available in some 50 permutations formed from basic headstocks, tailstocks, drive units, control system and copying attachments. This one has a 500-mm swing over bed, 24 spindle speeds from 11 to 1800 rpm, and five optional beds which give turning lengths from 2½ to 5 meters. Machine is made in the "May 8th" factory in Karl Marx-Stadt (formerly Chemnitz) but retains the old name of Niles for export

Link-lines of standard machine tools point up...

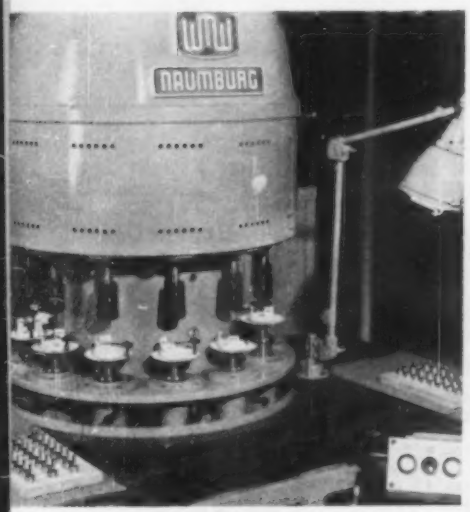
Automation at the Leipzig Fair

East Germany's trend toward building-block machine tools (AM/MM—Apr 4 '60, p128) in link-lines was much in evidence at the recent Leipzig Fair. East Germany, it is now evident, is second only to Russia in the Soviet setup as a builder of sophisticated machine tools and developer of advanced machining concepts

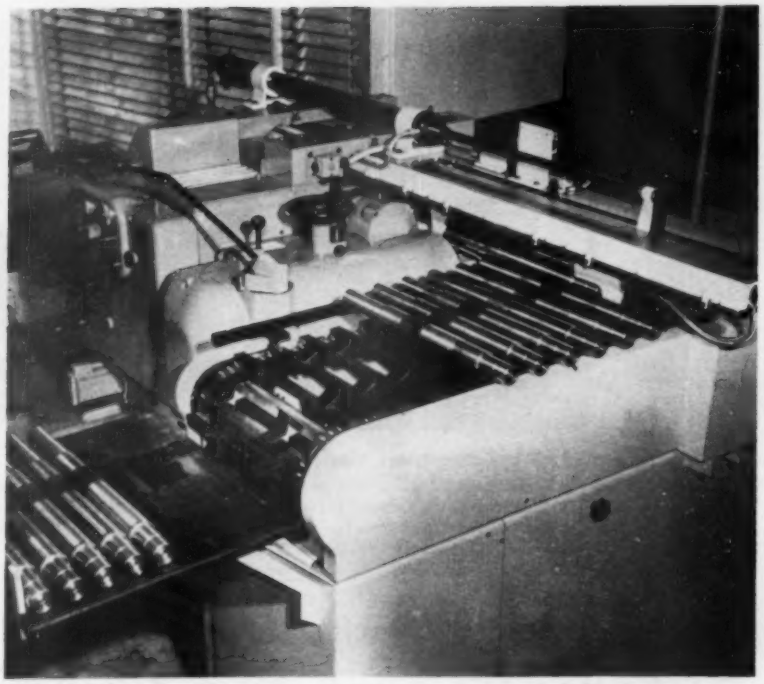




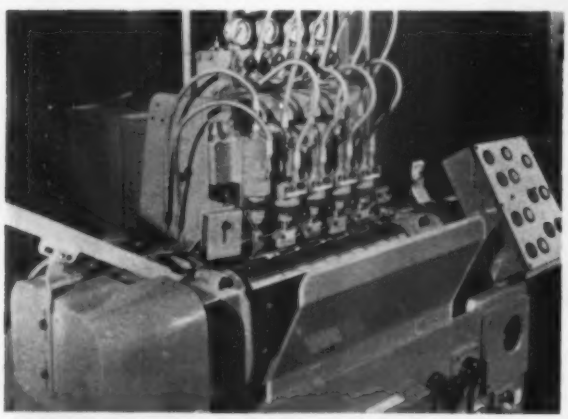
Link-line setup at Leipzig . . .
Intended for link-line installation for manufacture of electric motor armature shafts, the standard copy lathe (above) is fitted with an automatic load-unload unit, which is self-propelled on an overhead track (see photo detail at right). Separate pneumatic load and unload arms on an electrically driven carriage shaft shuttles between the work position and adjacent "in" and "out" tracks. During turning, the carriage traverses to overhang the work. When cut is completed, the unload arm drops to grip the shaft with two pairs of claws, while an attached electric gaging head checks the machined diameter. As the chuck opens and the tailstock retracts (see photo above), the carriage moves slightly sideways to withdraw the shaft from the chuck, then the unload arm lifts to the travel position. Load arm then drops to insert the next shaft into the chuck in a reverse sequence of movement. When this arm retracts, cutting cycle starts and the carriage traverses to right of the lathe, where the finished shaft is unloaded onto the exit track



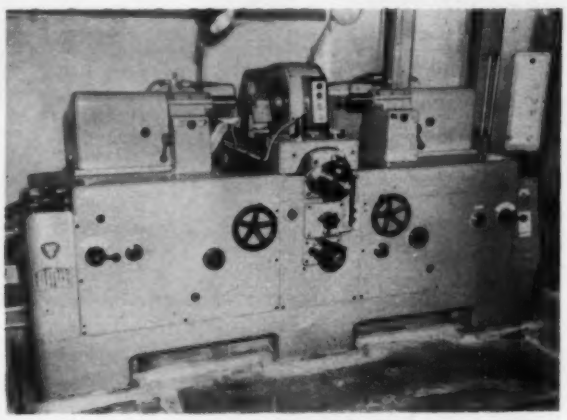
12-spindle machine . . .
. . . for lapping internal seats of diesel injector nozzles operates on 25-second cycle. Annular worktable and spindle column rotate continuously as a unit. At load position, a nozzle body is manually inserted in the empty pedestal so that it is closely retained by a spring clip—with its jet hole submerged in a dish of lapping solution. Needle is placed in the spring-loaded collet chuck on the overhanging spindle, pedestal is raised, and as table rotates, the spindle is engaged and driven at 680 rpm – periodically withdrawing so that fresh solution can be drawn in through the holes. Full rotation takes 4 minutes



Hydraulic knurler . . .
. . . designed for link-line installation cold rolls serrations on a section of electric motor shafts to take pressed-on armature laminations. Work from previous machine is carried on V blocks on an indexing chain conveyor. At the load position, incoming pre-drilled shafts are gripped endwise between hydraulically extended centers on the traversing carrier. This mechanism moves the shaft to the work position, where two circular dies feed into form the serrations. Carrier then returns the shaft to the conveyor, releasing it automatically onto the waiting blocks. A complete 10-station link line for this component is already operating at a plant near Dresden



Centerless superfinisher . . .
. . . for taper bearing rollers has work supported and rotated by a pair of stepped cylinders. Stones of progressive fineness at four stations are vibrated hydraulically by a short-stroke piston. After each cycle the tool slide retracts upwards, and the entire line of rollers is advanced by a comb-shaped transfer bar between the cylinders—which lifts them over its stepped shoulders. Work is fed in by a hydraulic probe before the first station, which stops the machine when reloading is required



Twin-spindle internal grinder . . .
. . . roughs and finishes three diameters in an automatic cycle. Demonstration workpiece at Leipzig was a helical spur gear integral with an internally stepped shaft. Special fixture grips gear teeth as work is hydraulically clamped in the carrier when it is extended forward on its transverse slide. After loading, work carrier retracts and the opposed grinding spindles feed into the bore (left one has a profile wheel to cut two diameters). Spindle heads operate independently, wheels are automatically dressed

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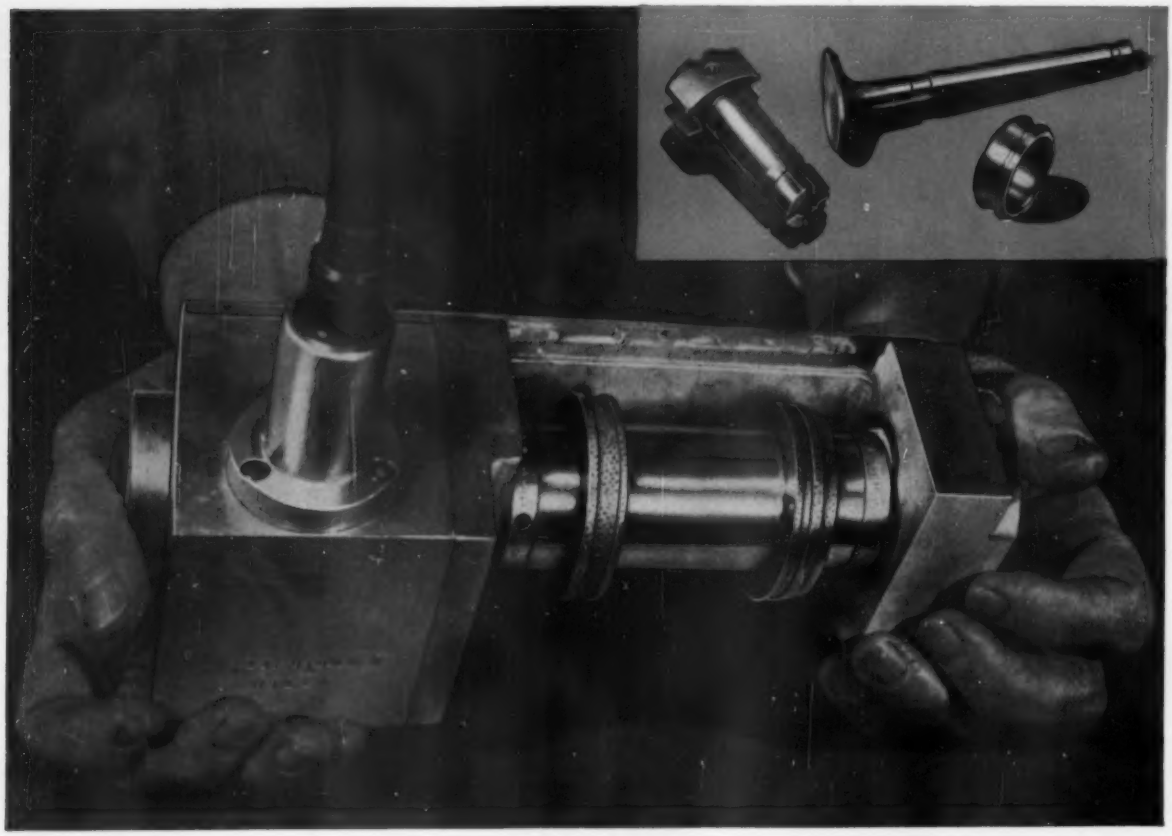

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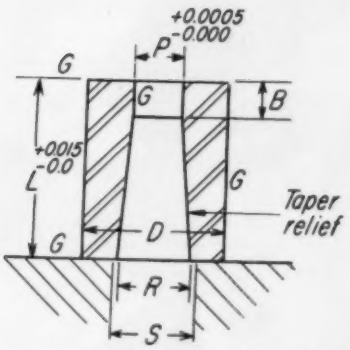
Standard Punches and Die Buttons



Approved by the Dayton Chapter of the ASTME Standards Committee, and planned to be effective Oct, 1960

CONCENTRICITY: (P:D)—0.0000 – 0.0005 T.I.R.

HARDNESS—Rh 59-63C

WEAR LAND—Taper relieved, 0.001 – 0.002

CHAMFER—1/64 in., approx, both ends

Press-Fit Die Buttons

Body Dia D	I.D. Range* P	Overall Lengths L	Wear Land B	Relief Hole (max) R	Slug Hole (rec) S	Press fit Allowance D
3/8	0.062-0.155	3/4 1	1/8†	0.206	0.218	+ .0005 + .0008
1/2	0.128-0.200	3/4 1	5/32†	0.267	0.281	
5/8	0.185-0.260	3/4 1	3/16†	0.325	0.343	+ .0010 + .0014
3/4	0.245-0.335	3/4 1	3/16†	0.400	0.437	
7/8	0.326-0.410	3/4 1	1/4‡	0.473	0.500	
1	0.395-0.512	3/4 1	1/4‡	0.575	0.593	
1 1/4	0.506-0.641	3/4 1	5/16‡	0.698	0.718	+ .0015 + .0020

* In 0.003 increments starting with the minimum and ending with the maximum size of each range.
† + 1/32, -0. ‡ + 1/16, -0.

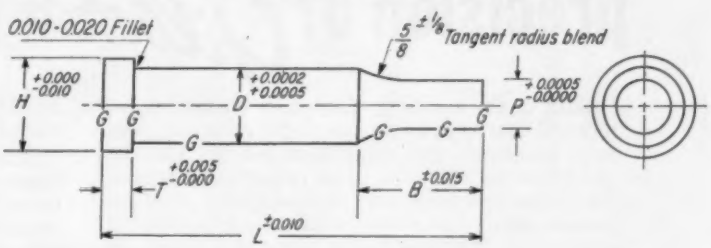
CONCENTRICITY: Point to Shank (P:D) — 0.0000 to 0.0005 T.I.R.

HARDNESS: Point & Shank—Rh 60-62C
Head—Rh 40-50C

TAPER: Point Diameter — Backtaper permissible, no foretaper. Shank Diameter — Foretaper permissible, no backtaper.

PILOT LEAD: Shank Diameter — Optional.

Extracted from "ASTME Standard Heavy-Duty Head Type Punches," published by American Society of Tooil and Manufacturing Engineers, Detroit. Effective date for use, Oct, 1959



Heavy-Duty, Head-Type Perforating Punches

Shank Dia	Range of Point Dia	Standard Point Diameters	Head Dia	Head Thk	Point Lg.	Over-all Lengths L
D	P	P	H	T	B	L
3/16	1/32—3/16	1/32 3/64 1/16 5/64 3/32 7/64 1/8 9/64 5/32 11/64 3/16	1/4	1/8	7/16	1 1/2 | 1 3/4 | 2 | 2 1/4
1/4	1/16—1/4	1/16 5/64 3/32 7/64 1/8 9/64 5/32 11/64 3/16 13/64 7/32 15/64 1/4	3/8	1/8	1/2	1 1/2 | 1 3/4 | 2 | 2 1/4 | 2 1/2
5/16	3/32—5/16	3/32 7/64 1/8 9/64 5/32 11/64 3/16 13/64 7/32 15/64 1/4 13/64 5/32 15/64 5/16	7/16	1/8	9/16	1 1/2 | 1 3/4 | 2 | 2 1/4 | 2 1/2 | 2 3/4 | 3
3/8	1/8—3/8	1/8 9/64 5/32 11/64 3/16 13/64 7/32 15/64 1/4 17/64 9/32 19/64 5/16 21/64 11/32 23/64 3/8	1/2	3/16	5/8	1 3/4 | 2 | 2 1/4 | 2 1/2 | 2 3/4 | 3
1/2	3/16—1/2	3/16 13/64 7/32 15/64 1/4 13/64 9/32 15/64 5/16 21/64 11/32 23/64 3/8 25/64 13/32 27/64 7/16 29/64 15/32 31/64 1/2	5/8	3/16	13/16	2 | 2 1/4 | 2 1/2 | 2 3/4 | 3 | 3 1/2
5/8	3/8—5/8	3/8 25/64 13/32 27/64 7/16 29/64 15/32 31/64 1/2 33/64 17/32 35/64 9/16 37/64 19/32 39/64 5/8	3/4	1/4	15/16	2 | 2 1/4 | 2 1/2 | 2 3/4 | 3 | 3 1/2
3/4	1/2—3/4	1/2 17/32 9/16 19/32 5/8 21/32 11/16 23/32 3/4	7/8	1/4	1 1/16	2 1/4 | 2 1/2 | 2 3/4 | 3 | 3 1/2 | 4
1	11/16—1	11/16 23/32 3/4 25/32 13/16 27/32 7/8 29/32 15/16 31/32 1	1 1/4	3/8	1 1/4	2 1/2 | 2 3/4 | 3 | 3 1/2 | 4

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Gilbert & Barker Mfg. Company builds its famous Gilbarco gasoline pumps for oil companies large and small, and ships them to every state in the union as well as to most countries overseas. To insure precision and dependability of these pumps, great care must be taken in all assembly operations. Fasteners, for instance, must be torqued precisely to keep all components in perfect alignment.

Because of the critical importance of fasteners to its products, Gilbarco has selected Stanscrew heat-treated cap screws for such key applications as the positive displacement meter (shown in the insert). Stanscrew fastener specialists were happy to assist Gilbarco engineers in determining the right fastener with the correct torque to assure trouble-free service.

Gilbert & Barker is one of a long roster of honored names in American industry who have found it pays to standardize on Stanscrew. A product of unsurpassed quality . . . a broad selection of more than 5,500 different fasteners . . . prompt service through local distributors, backed by complete stocks at three conveniently located plants . . . these are a few of the reasons Stanscrew means greater value in fasteners.

Stanscrew's experienced fastener specialists can often suggest ways to improve your assembly procedures. Your local Stanscrew distributor will be happy to arrange a prompt visit. Call him today.

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STANDARD SCREW COMPANY 2701 Washington Boulevard, Bellwood, Illinois

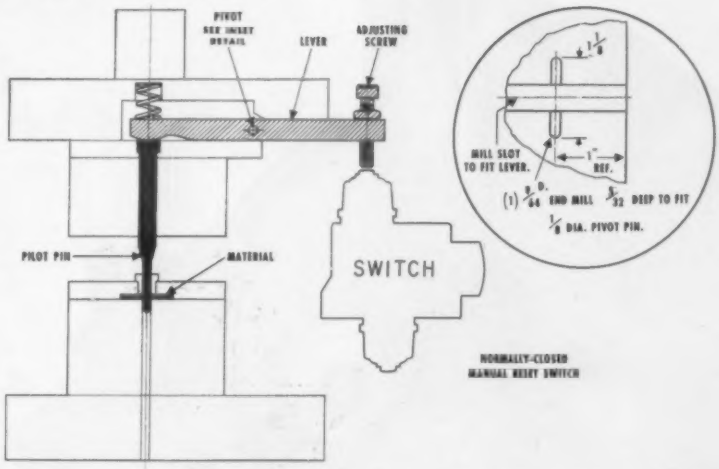
Snap-Action Switches in Dies—I

Precision snap-action switches can be arranged to detect misfeeds and other faulty operations of press tooling. Their use can substantially reduce die maintenance. Further, these switches can be arranged to detect malfunctioning of automatic feeding equipment. Four examples illustrate how you can apply these safety devices to typical situations.

By George O Brown, supervisor, Tool Design & Procurement,
Micro Switch Div, Minneapolis-Honeywell Regulator Co, Freeport, Ill

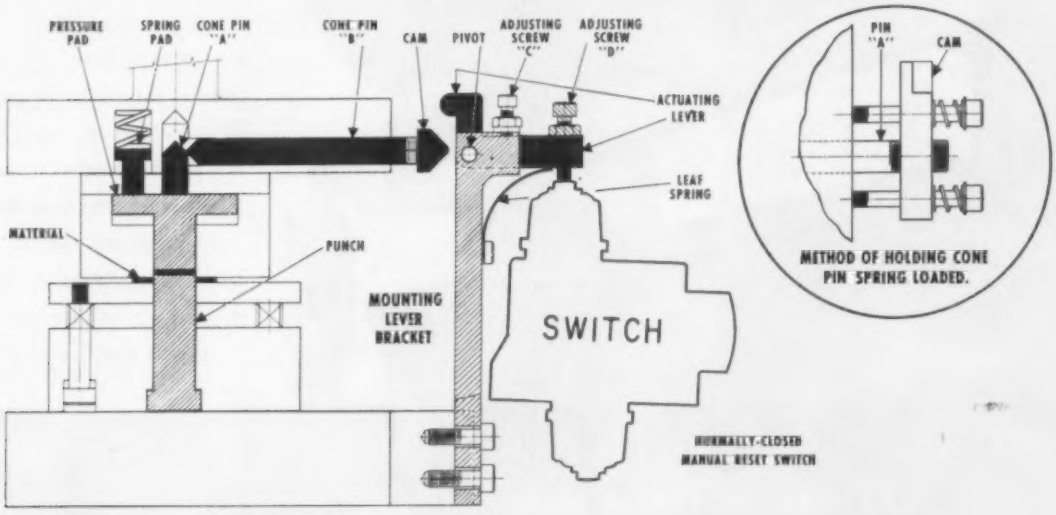
1—Misfeed Detection

The switch is interlocked electrically with the punch-press motor circuit to stop the press before a misfeed can cause injury to the die and further waste of stock.



NORMAL OPERATION—If the material is in position the pilot pin enters the pilot hole in the stock when the die closes. Because the pilot pin is able to function and locate the material properly, the normally closed switch is not actuated. Therefore, the press can be recycled.

ABNORMAL OPERATION—If the pilot pin cannot enter the stock because of a misfeed, the pin is forced upward, causing the adjusting screw to actuate the switch. This action opens the motor circuit. The press is stopped and cannot be started until corrective measures eliminate the cause for misfeed. The lower plunger is then used to reset the switch to the normally closed position.



2—Pressure-Pad Malfunctioning

Again, a normally closed manual reset switch is employed. If the pressure pad doesn't function, the switch breaks the motor circuit.

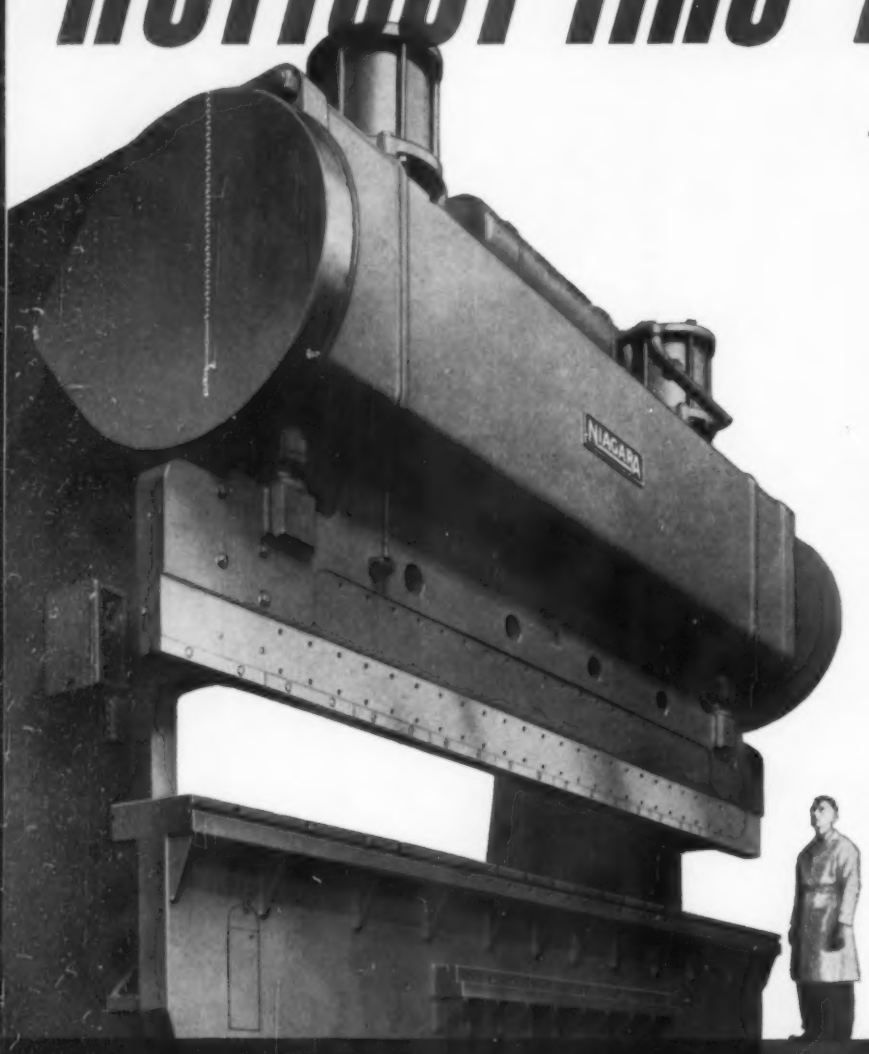
NORMAL OPERATION—As the ram descends, the pressure pad moves down with the punch to blank the material. Cone-ended pin *A* moves upward in a recess and forces cone-pin *B* to move outward against spring pressure (see detail inset). On the upstroke, the two pins return to the normal position, allowing the cam on pin *B* to clear the switch-actuating lever.

ABNORMAL OPERATION — If the pressure pad sticks in the up position and fails to shed the blank, the cam is held out. The actuating lever is tripped on upstroke and the press is stopped.

(*Continued on page* 131)

NIAGARA PRESS BRAKES

hottest line today



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What's behind it? **Performance!** Downright, measurable, press brake performance! High hourly output with minimum operator effort is setting new work standards in plant after plant.

How about you? Want to sail through your schedules at record-breaking speed... cut your operating and maintenance costs to the bone... hold your capital investment to a **practical minimum... then Niagara is the press brake for you.**

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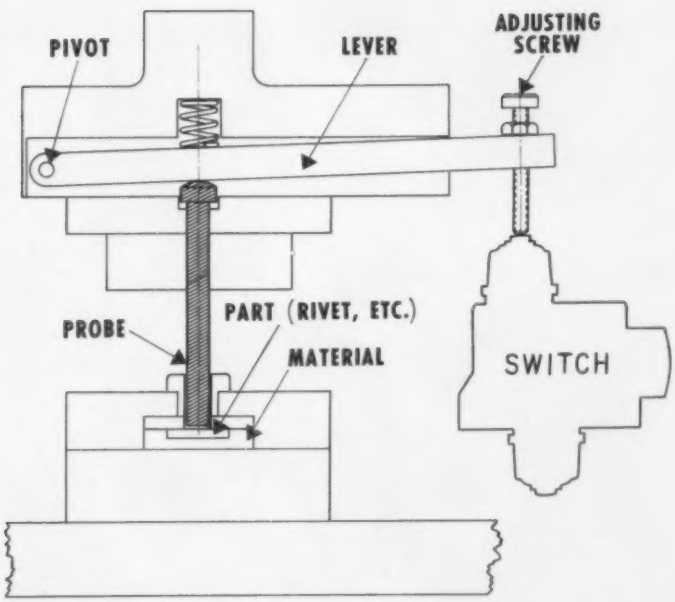
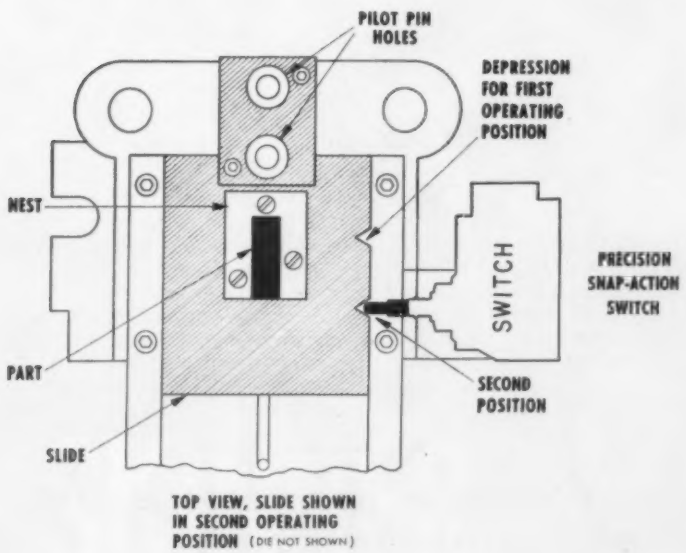
Snap-Action Switches in Dies—II





TOP VIEW, SLIDE SHOWN IN SECOND OPERATING POSITION (DIE NOT SHOWN)

3—Absence of Part

When one part is being assembled to another, perhaps at a station in a progressive die, it is essential to know that assemblies are not produced with missing parts or that a pileup will not occur.

NORMAL OPERATION—A probe enters the die hole at the inspection station. If the part (rivet, etc) is present, the probe is forced upward and the switch is not actuated, and press is allowed to cycle.

ABNORMAL OPERATION—If a part is missing or not in correct position, the probe enters the die hole beyond the normal depth. The spring-actuated lever and adjusting screw then operate the switch, which is of the normally closed type. Thus, the electrical circuit to the press control is opened and the press stops.

4—Safety for Two-Position Slide

A two-position die with a slide-feed nest can greatly increase productivity on consecutive forming or assembly operations. It is essential that the slide be positioned accurately.

NORMAL OPERATION—Two notches in the edge of the slide correspond with die spacing. The normally closed switch is held open by the edge of the slide. When the nest is in position for the first operation, the plunger falls into the first notch, the switch is released and the press cycles. As the slide is pushed to the second position, the plunger falls into the second notch and the press again operates. Note: the slide must be designed to hold the switch open when pulled out to the load position.

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through intensive research

A new COMPUTER (the latest BENDIX Alpha-Numerical type) has enabled us to greatly accelerate our continuing program of basic research in both gear and broaching practice.

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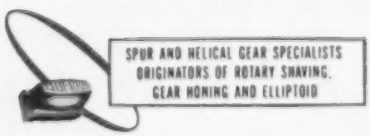
Red Ring engineering know-how plus high-speed electronic calculation is your assurance of the most effective tooling for your own production needs.



Write for Bulletin CAP 57-11

NATIONAL BROACH & MACHINE CO.

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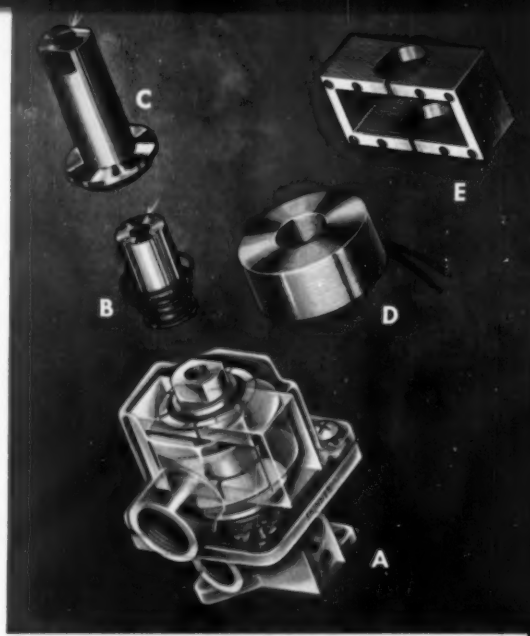
New SKINNER 3-way Solenoid Valves

All Skinner Solenoid Valves are...

SIMPLE— Only two moving parts in direct acting valves. Stainless steel internal parts resist corrosion. Soft synthetic inserts provide bubbletight sealing. Most types available in explosion-proof construction.

VERSATILE— Literally thousands of variations are possible—mounting, flow control and porting . . . electrical options in coils, voltages and frequencies . . . types of media, operating temperatures, etc.

UNIQUE— Skinner valve seat does not cut inserts, assures bubbletight sealing and long life. Skinner valve sleeve assembly is precision welded to provide over 5,000 PSI burst strength. Skinner standard valve designs are readily modified for custom applications. From first step in manufacturing to delivery, Skinner quality control and 100 per cent testing builds valves Skinner guarantees for long, trouble-free life.



A—Transparent view of normally closed valve with main orifice shown solid
B—Plunger and spring C—Sleeve D—Coil E—Yoke

SKINNER three-way solenoid valves solve your control system problems

Whatever your problem in controls . . . in machine tool automation, automatic clutching or braking, packaging, instrumentation, laundry equipment, air conditioning, or in any of thousands of applications involving air and hydraulic cylinders or pressurized mechanisms . . . Skinner has the answers.

Skinner design leadership and quality manufacture of solenoid valves has been proved by universally successful use. And as control problems become more complex, Skinner keeps pace with new designs, new valves, and continued top quality production.

The new A series shown above, the new L series, the V5 and V10 series complete the line of Skinner 3-way solenoid valves. Your selection is unlimited.

	V5 Series	V10 Series	A Series	L Series
Orifice sizes	1/32" to 1/4"	3/32"	3/32", 1/8", 5/32"	3/16", 1/8", 3/4"
Pressure Ratings	Up to 200 PSI	1000 PSI	Up to 250 PSI	5 to 150 PSI
Types	Normally open, normally closed, directional control, multi-purpose	Normally open, normally closed, directional control, multi-purpose	Normally open, normally closed, directional control, multi-purpose	Normally open, normally closed, directional control
Construction	Stainless steel body Stainless steel internal parts	Stainless steel body Stainless steel internal parts	Zinc die-cast body Stainless steel internal parts	Forged naval brass body Stainless steel and brass internal parts
Body Pipe Connector	1/8 and 1/4 NPT	1/8 NPT	1/4 NPTF	3/8", 1/2", 3/4" NPTF

When you specify solenoid valves, specify Skinner. Skinner solenoid valves are distributed nationally.

For complete information, contact a Skinner Representative listed in the Yellow Pages or write us at the address below.

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Talking Shop...

Plant Sign

SEEN in a metalworking plant recently: "Work eight hours a day. Sleep eight hours a day. But not the same eight hours."

Hydrostatic Transmission

DESIGNERS of automobiles have often dreamed of a hydraulic transmission system with motors at each wheel and a pump to replace the conventional transmission. Latest step toward realization of this is the experimental International 340—a utility tractor with a single lever to control forward or reverse motion. In neutral the tractor is positively braked. This lever controls a variable displacement pump (the transmission) coupled to the engine. By changing the angle of swashplate in the pump, the control lever can lengthen or shorten the stroke of nine plungers, changing tractor speed.

Silver Slots

TEXAS INSTRUMENT builds a high-resolution radar mapping system. Part of the problem is close tolerances in cutting coil silver for the linear slotted array antennas. With a carbide saw operating at high speed, depth of cut is held to ± 0.0003 in., width of cut to ± 0.002 in., and accuracy between slots to ± 0.0005 in. over a 12 ft length. Each slot is cut to a different angle with a tolerance of 0.010°. The system provides aerial mapping from the outside of an aircraft.

Gage Block

IN THE COURSE of introducing a new 56-piece gage block set for shop use, DoAll uncovered some interesting history on the composition of gage block sets.

C E Johansson conceived his system of arithmetic combinations of gage blocks on a train returning to Sweden from the Mauser gun factory in Germany. This was in 1896 and his set was for 102 blocks to measure from 1 mm to 201 mm in increments of 0.01 mm. He conceived the blocks as for shop use rather than laboratory use. Nine blocks were later added to provide increments of 0.001 mm.

When the first inch set (81 blocks) was made in 1906 it was part of a program to reconcile gage block standards with official length standards in the English system. This program was far removed from shop requirements and the lack of range in small dimensions was of little importance.

The 56-piece set now developed is based on frequency of use rather than historical precedent and designed to produce fractional dimensions by 64ths and decimal dimensions to 0.010 in. Basing the set on frequency of use (as determined by wear of blocks returned for calibration) DoAll hopes the new smaller set will serve as a shop tool.

Gone Tools

IN AN EFFORT to promote a little more respect in the handling of tools, *Royal News* reports on some of the tools used per year by the toolroom in the typewriter plants of Royal-McBee.

It doesn't surprise us that they use 480 screwdrivers a year, 720 center drills, 1200 slotting saws, 288 grinding wheels, and 600 dovetail end mills. We aren't especially surprised at 350 lb of rubber bands. But we are downright amazed at a consumption of 72 pencil sharpeners a year. Where do they all go?

. . . All the Time

IN AN EFFORT to keep employees safe not only at work but around the clock, Allis-Chalmers has initiated a program for this year with the theme "safety everywhere . . . all the time." This is the third year in which A-C has had a specialized safety campaign. During this period the frequency rate of accidents at West Allis has dropped from 6.4 to 3.6—a drop from 201 disabling injuries in 1957 to 91 in 1959.

Atomic Number 79

IF YOU USE gold in your shop — regularly or for plating the millionth part that comes off your production line—you'll be interested in this quotation:

"It has been estimated that the total amount of gold won from the earth's surface in the last five centuries is about 110,000,000 lb. That weight of gold, over 50,000 tons—for its specific gravity is very high at ± 19—could be contained in a cube measuring 15 yards in each direction."

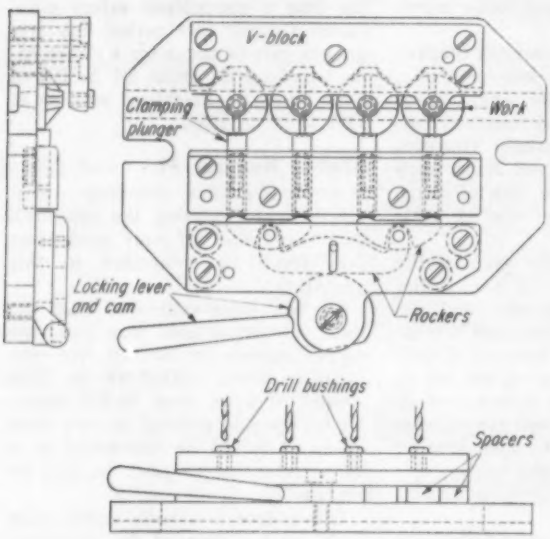
Our source is a book, aptly titled *Gold*, just published by McGraw-Hill. According to author C H V Sutherland, more than four-fifths of this total has been extracted from the earth during the last century. Chief reason for today's higher production: Modern mining techniques, which make it possible to dig deep into the earth—as far as 10,000 feet.

But mining of this sort is expensive. According to Sutherland, a South African mining company may have to raise and mill over 60 million tons of ore just to get 400 tons of pure gold.

All this digging reminds us of the man who couldn't quite understand why so much gold is dug up in Africa. After all, he reasoned, it will have to be buried again when it gets to Fort Knox.

Practical Ideas...

Multiple-Drill Jig Equalizes Holding Force on Workpieces



A large number of warm-pressed brass parts had to be centrally drilled as the first step in a short series of operations. Having been made in a forging die, the parts were held to close limits on all dimensions so a drill jig was therefore the obvious workholding device to be used. But, the number of parts made the job of a single-spindle operation a big one.

The only answer was then to drill as many parts at one time as possible. We decided four pieces an easy amount to handle and set out to design a fast loading and locking jig to hold them and to guide the drills. The multiple-parts jig shown in the sketches is the result as is a 300% increase in production.

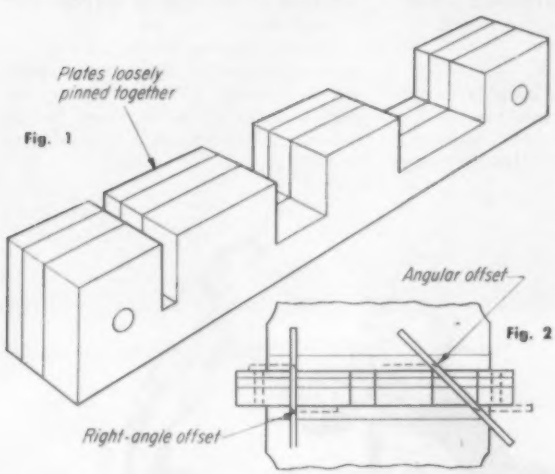
The locking device, consisting of a cam applying pressure on three rockers linked together, works smoothly and with positive action. A clockwise half revolution of the cam brings four spring-loaded plungers forward to individually lock workpieces into V's. Swinging the cam counter-clockwise places a flat against the main rocker and allows the plungers to retract. Work can then be passed between the V and the plunger blocks in either direction for unloading and loading with one operation. Four new workpieces will push four drilled pieces out.

The four V's are machined into a single block which remains stationary near the back end of the base. On top of it mounts a plate carrying four drill bushings. The plunger block is milled with four slots spaced centrally to the V's as are the slots in the base which house the return springs. Both the plungers and the V's have beveled faces to make sure the work contacts the base.

Spacer bushings on the mounting screws for the locking device provide the necessary clearance for the cam and rockers. A guide pin working in an elongated hole through the plate and seated in the rocker keep the rockers in line. Chip clearance is through holes connected by a channel milled on the underside of the base.

Hjalmar Dahl, Upplands Vasby, Sweden

Simple Tool Bends Offset Brackets



Many diversified fields require tailor-made brackets in some form, either for joining components or mounting whole assemblies. In many instances, the amount of offset and the degree of bend are of utmost importance, as is practically always the case when two or more brackets have to match each other. Some tooling will therefore be necessary, but unless the work is done on production basis, the cost can be prohibitive.

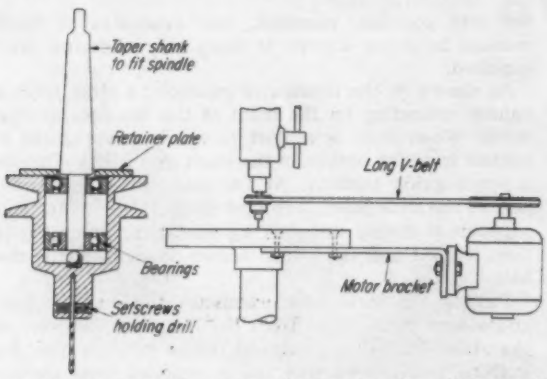
Fig. 1 illustrates a tool that fills the bill for an inexpensive bending fixture and yet capable of producing offsets in varying degrees. The fixture consists of a series of plates loosely pinned together with matching grooves cut in one edge. These plates may be of the same thicknesses or they may differ as in the sketch. The idea is to have thicknesses that will combine to the required amount of offset.

The grooves also differ in width; the narrowest being only slightly wider than the material to be bent. The others are wider and made to form angular offsets as required. All bending corners are rounded to avoid cutting the material.

Fig. 2 shows the method of using the tool. It is gripped in the vise with the grooves extending above the vise jaws. At left, a piece has been placed in the narrow groove and the ends are driven in opposite directions to form a right-angle bracket as indicated by dotted lines. A more gradual offset is produced by placing the piece in a wider groove as shown at right.

L. Kasper, Philadelphia, Pa

Speed-Drill Head Combines With Large-Capacity Table



We had two good reasons for constructing this speed head to be used in a large drillpress. The first was that we had a number of wire-size holes to drill, and the second was that we needed the capacity the larger table gave us.

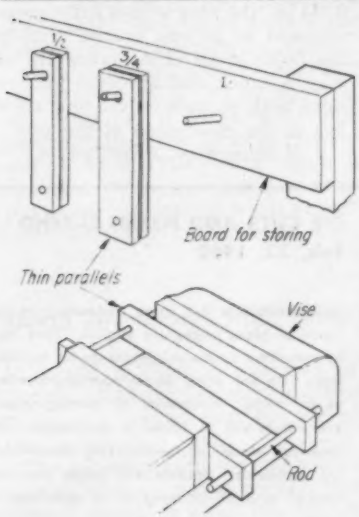
To clarify this, the job before us consisted of drilling No. 53 holes in plates, too big to be handled in a standard high-speed drillpress. And, naturally, the spindle of the press which could accept the work was too slow. By combining the independently-powered speed head with the large capacity, we were able to turn out a professional job. The larger table proved adequate for shifting the work from one hole position to the next. Extra care had, of course, to be exercised in feeding the drill because of the heavier and less sensitive spindle.

As shown in the cross-sectional sketch of the head, the mounting spindle has a standard taper with a shank turned down to take a pair of ball bearings. Bored to a snug fit over the bearings, the housing also holds a bearing ball in the bottom of the bore against which the shank thrusts.

In machining the OD of the housing, it is best to mount it on a stub arbor to insure concentricity. This is important as the drill must be concentric with the axis of the spindle. The V-belt pulley is then machined and a hole is drilled in the end to accept a No. 53 drill shank. Two setscrews hold the drill in place. This end can, of course, be turned to a taper or threaded and fitted with a precision chuck if so desired. After the parts have been assembled, a retainer plate—which also serves to keep out dirt—is centered around the shank and screwed to the housing.

A simple L-bracket, mounted on the underside of the table, supports an electric motor. The length of this bracket and the length of the belt used govern the height to which the spindle can be raised.

R B Bashford, Newbury, England



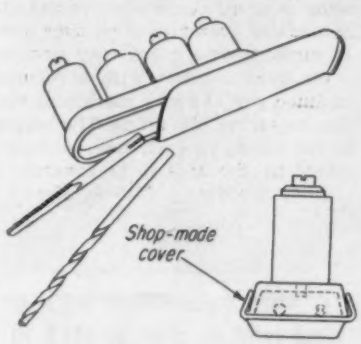
Rods Steady Milling-Vise Parallels

If you're using thin parallels in your milling vise, you know how easy it is to tip them and even knock them completely out of the vise while loading and unloading work. This doesn't mean that thin parallels are no good, on the contrary, they can be counted among the handiest accessories in the drillpress or miller.

To improve them, by way of making them steadier in use, we have drilled holes in both ends through which rods are inserted. These rods have sliding fits in the holes spaced to place them outside the jaw ends.

Thus the parallels are easily removable in pairs for cleaning the vise prior to loading the next workpiece. In storing, the holes are used to hang the parallels in their respective places on a board.

Charles Willey, Penacook, NH



Tool-Button Base Holds Tap and Drill

Having the right drill and tap handy when a toolmaker's button has to be attached to the work can save you time as well as unnecessary steps to the tool crib. Most well-organized toolmakers will keep a drill and tap in the corner of one of their tool-chest drawers, but this is not always the most practical way. The mere opening and closing of the drawer will cause them to mix with other tools and time is wasted in looking for them.

A better way is to keep the drill and tap together with the buttons as one unit. This is done by putting them into the hollow base supplied with the buttons, and closing the opening with a slide cover, as shown at top left in the sketch.

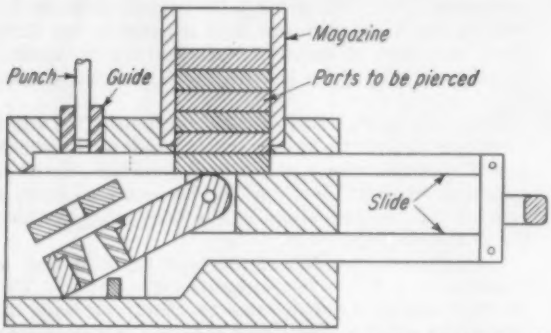
This cover is made of aluminum, bent to fit snugly against the tapered side of the base. A small tab is bent down at one end to provide a better grip on the cover.

However, should your tool buttons have been supplied on a flat mounting plate, which is sometimes the case, it's a simple matter to mill your own hollow base. Sketch, lower right, shows the side angles of the base. The ends can be either round or square.

H J Gerber, Stillwater, Okla

Practical Ideas...

Semi-Automatic Device Feeds Parts to Punch



A simple job, like punching a hole in a part as a second operation, can be troublesome because of the handling problem. However, with a magazine and semi-automatic feeding device incorporated on the die, the parts are fed into position, punched, and evacuated without manual handling except to keep the magazine well supplied.

As shown in the illustrated example, a slide with a handle extending on the front of the die does all the work. When slide is moved forward, a workpiece is pushed from the bottom of the stack into position under a punch-guide bushing. At the same time, the lower part of the slide raises a hinged die-bushing holder and supports it during the piercing operation. The press is then tripped and the punch comes down to pierce the hole.

Pulling the slide back evacuates the finished part and a new piece drops from the magazine in front of the slide. The slug produced drops through the die bushing in the usual way and is expelled from the die on the next forward stroke.

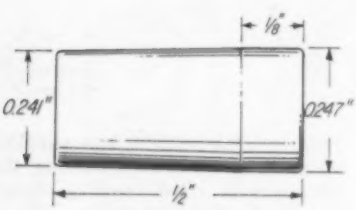
Federico Strasser, Santiago, Chile

Paint Roller Applies Oil

A paint roller has become standard equipment in our shop. We use it to apply oil on strip stock being fed into blanking and drawing dies. In almost all types of planing work, and on most milling operations, a roller oiler is more convenient to use. It spreads an even film of oil over metal surfaces with quick easy strokes.

We keep a roller with a regular inclined pan at every machining station requiring film oiling. The length of the roller, in each case, is determined by the area to be covered.

R M Woodbury, Natick, Mass



Carbide Plug Sizes Holes

After several unsuccessful attempts at producing accurately-sized holes in a cast-iron part, we found the answer to our problem in a simple burnishing plug. Reamers were tried, but they either cut over size or gave a poor finish. We also tried a burnishing ball, but it did not give us a straight hole, probably because of the different densities in the iron. Honing was given a trial too, but found to be too slow and expensive as we had several thousandths holes to do.

The tolerance of the holes was extremely close; the specifications calling for a diameter of 0.245 in. −0.0000 +0.0002 in., each hole being 1 in. long. This didn't allow us much leeway, but after some experimentation, we found the necessary plug diameter.

Starting out with a piece of ¼-in. tungsten carbide, we first ground its diameter to 0.247 in. This was followed by tapering the end to 0.241 in. for a distance of ⅜ in. After rounding the edge of the small end, the plug was cut off at an over-all length of ½ in. leaving the burnishing diameter ⅛-in. long. As a finishing touch, the edge of the large end was also rounded to make sure no burs would project.

Upon reaming all holes to 0.242-0.244 in., the plug with a little grease smeared on it was pushed through the holes in an arbor press. In this way, a quick and accurate job was done with no wear on the plug showing at the conclusion of the job.

J H Spearman, Brooklyn, NY

Ivar Ost
Brooklyn, N. Y.
Won $25 for his idea:

DIE CUTS AND FORMS U-BEND
Feb. 22, 1960

AN EXTRA $25 will be paid for the best Practical Idea in each issue of *American Machinist/Metalworking Manufacturing*. Selection of the winning idea is made by a group of our readers.

PAYMENT—in addition to regular rate for item published—will be made as soon as tabulations are completed. The winner or winners—in case of a tie when duplicate prizes will be awarded—will also be announced in these pages.

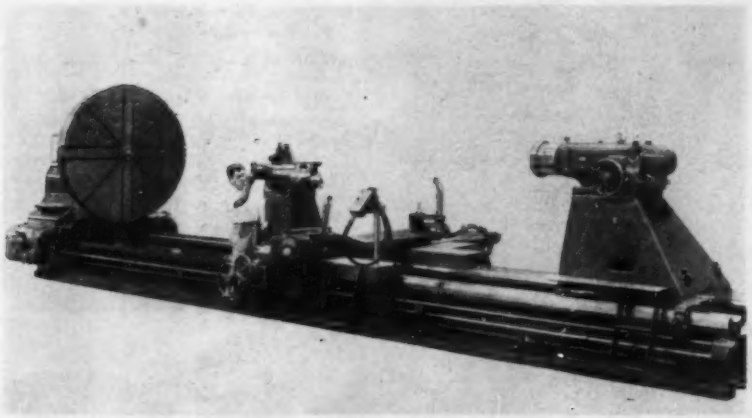
JUDGES . . . are a group of *American Machinist/Metalworking Manufacturing* readers who select articles they prefer in a particular issue. This group changes entirely with each issue and represents a true cross-section of our readers. Their decision is accepted by the editors, without reservations or bias, as final in each case.

REQUIREMENTS—All items appearing in the Practical Ideas pages are eligible. They must be submitted by the originator on an exclusive basis. Do not worry about your shortcomings as an author, draftsman, or photographer—every item will be edited in accordance with *American Machinist/Metalworking Manufacturing* standards. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of McGraw-Hill Publishing Co. Inc, and those of its advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send all entries to: "Practical Ideas Editor" *American Machinist/Metalworking Manufacturing*, 330 West 42nd Street, New York 36, NY.

New Shop Equipment
Materials and Parts



American Engine and Tracer Lathe With 74 To 108-in. Swing Handles Work to 40 Tons

Medium duty engine and tracer lathe, for use in the missile, shipbuilding and other heavy industries, will handle work up to 40 tons and make precise cuts to ¾-in. depth.

It is available in four sizes with swings from 74 to 108 in. over the bed. The bed is 56 in. wide with four hardened and ground replaceable V-ways. The tracer lathe is equipped with carriage mounted power unit and motor, hoses and fittings, hydraulic tracer valve, angle tracer slide with hydraulic actuating cylinder, periscope-type optical viewer, templet holder brackets and supports for flat templets.

Internal geared face plate drive, pendant controlled operation, 7½-in. dia tail stock spindle and traveling operator platform are standard equipment for either engine or tracer lathe.

American Tool Works Co, Pearl at Eggleston Ave, Cincinnati 2, Ohio

MORE DATA? Circle 51, inside back cover

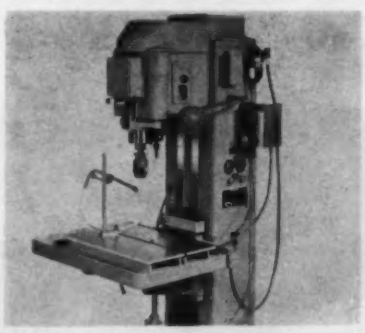
Holes in Printed Circuit Boards Plated by Electroless Process

Technique called Coperoid D builds up a copper deposit by chemical reduction on the inside of holes in printed circuit boards. Conventional plating builds up the coat to conductor thickness.

It is applicable to all types of copper-clad plastic laminates and can be used for metallizing other nonconductors, electroforming, electrotyping, and electronic applications. A sensitizing and a supersensitizing solution prepare the board to receive the complex copper solution. The copper will deposit almost immediately but 15 to 30 minutes immersion time is recommended to insure complete coverage.

MacDermid, Inc, Waterbury 20, Conn

MORE DATA? Circle 53, inside back cover



Stokes Introduces 25-ton Automatic Transfer Plastic Molding Press

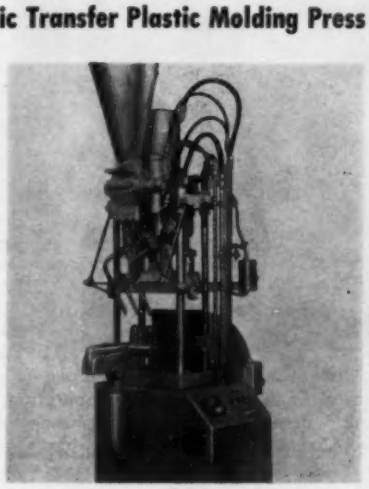
Model 725, a 25-ton air-operated automatic transfer plastic molding press, is a lowcost unit for use on short production runs.

The press has both top and bottom ejection systems and an air-operated blowoff device to clear the ejected pieces from the molding area. It is designed to operate with direct powder feed by means of a three-station rotary feeder.

The Model 725 has a 25-ton clamping pressure, 5½-ton transfer force, takes molds up to 11 by 6 in. and requires a 29 by 36 in. floor space.

F J Stokes Corp, 5500 Tabor Rd, Philadelphia 20, Pa

MORE DATA? Circle 52, inside back cover



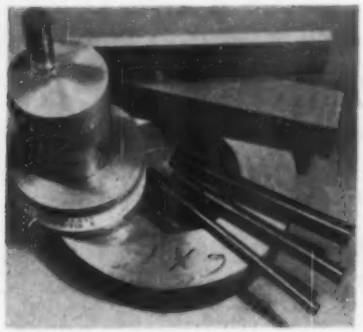
Vertical Drill Has Capacity Of 3/16 to ⅝ in. in Alloy Steel

Universal drilling machine, designated No. 3, incorporates infinite hydraulic feed control in conjunction with air feed. Hydraulic unit is adjustable for the amount of feed required and assures steady feed on interrupted cuts or break-through.

Worktable is automatically positioned by air for quick change of tools and fixtures. Two ranges of spindle speeds (with eight speed changes in each range) cover from 300 to 1800 rpm. Solenoid units built into the machine synchronize clamping and indexing fixtures.

Snow Mfg Co, 435 Eastern Ave, Bellwood, Ill

MORE DATA? Circle 54, inside back cover



Sintercast Offers Do-It-Yourself Carbides

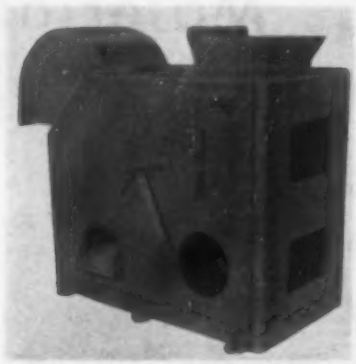
A do-it-yourself carbide, called Ferro-Tic S, can be machined with conventional tools and offers exceptional resistance to heat and corrosion. Produced by powder metallurgy techniques, the material consists of tiny crystals of titanium carbide embedded in a matrix of stainless steel and retains the properties of both constituents.

It is available in two grades, S-45 with a Rh 45C and S-55 with a Rh 55C. The softer grade can be machined by any conventional method, the harder grade can be sawed, drilled or turned.

The material can be supplied in rectangular form up to 1 x 2 x 7 in. and as round bars up to 2 in. OD by 6 in. long or 6 in. OD by 2 in. long. Special sizes and shapes can be produced on special order.

Sintercast Div, Chromalloy Corp, 132 Woodworth Ave, Yonkers 2, NY

MORE DATA? Circle 55, inside back cover



Automatic Screw Machine Chip Separator Uses Feeder-Vibrator

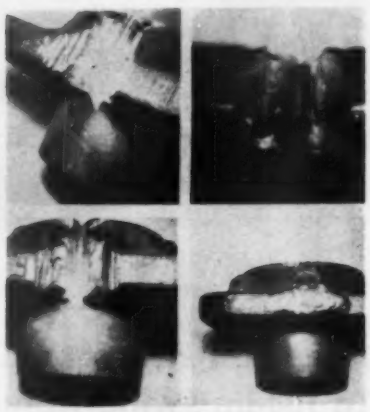
Model L floor type chip separator, equipped with a feeder-vibrator, will separate 1¼ cu ft of screw machine parts from scrap chips in one hour.

Over 50 graduated settings regulate the self-contained blower to provide close control of air required for clean separation of parts from 1/16 to 2 in. dia and ¼ to 6 in. long. Other new features include a 5-hp blower motor and a flow control hopper.

After cutting oils have been removed, the part and chip mixture is dumped into the top hopper from which the material is immediately fed, shaken and separated. Clean parts are discharged into a tote pan and the waste chips are carried away by the air and discharged.

McKenzie Engineering Co, 78 S Main St, Newton, Conn

MORE DATA? Circle 56, inside back cover



Process Said to Weld Cast Iron in One-Tenth Usual Time

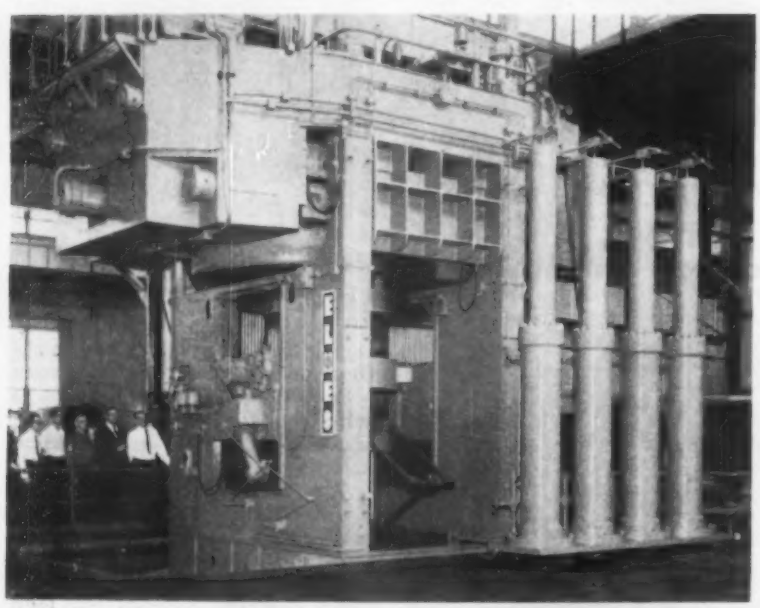
Process for arc welding cast iron in as little as one-tenth the time required by conventional methods is based on a new electrode that provides deposits that can be quenched without danger of cracking, thus eliminating the slow cooling between passes.

The three-step process, called Quenchweld, can be used for thin sections or heavy castings or on parts that cannot stand high welding temperatures. Applications include repairing broken castings, filling blowholes, buildup of damaged gear teeth, joining cast iron and steel.

The success of the process depends upon eliminating stress concentration, contamination of weld, and stresses due to cooling which exceed the weld metal strength. Steps are illustrated above: upper left, cracked flange has been veed out with chamfering electrode; upper right, chamfering electrode has been used to make anti-stress grooves; bottom left, grooves have been filled and entire vee coated with sealing electrode; bottom right, finished weld has been built up with Quenchtrode 24 electrode.

Eutectic Welding Alloys Corp, 40-40 172nd St, Flushing, NY

MORE DATA? Circle 58, inside back cover



HYDROSTATIC COMPACTING PRESS provides a 20,000-psi working pressure, weighs 265 tons and is 25 ft high. It was designed by Elmes in cooperation with the University of California and the AEC—*Elmes Engineering Div of American Steel Foundries, 1150-A Tennessee Ave, Cincinnati 29, Ohio*

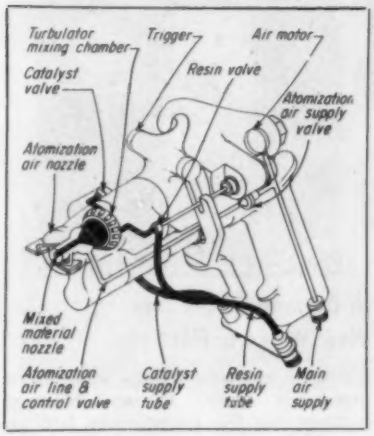
MORE DATA? Circle 57, inside back cover

Armco Adds New Grade to Line Of High Strength, Low Alloy Steel

High Strength No. 5 finds its principal applications in industries requiring a material of high strength but only moderate corrosion resistance, such as transportation, construction, and industrial equipment. Corrosion resistance is said to be equivalent to copper bearing mild steel. Fabrication in the as-rolled condition is limited to simple bending across the rolling direction and very light flanging and forming operations. Fusion welding can be done by any of the common methods without pre- or post-heating. Material can be supplied in both hot rolled strip and hot rolled sheet.

Armco Steel Corp, Middletown, Ohio

MORE DATA? Circle 59, inside back cover



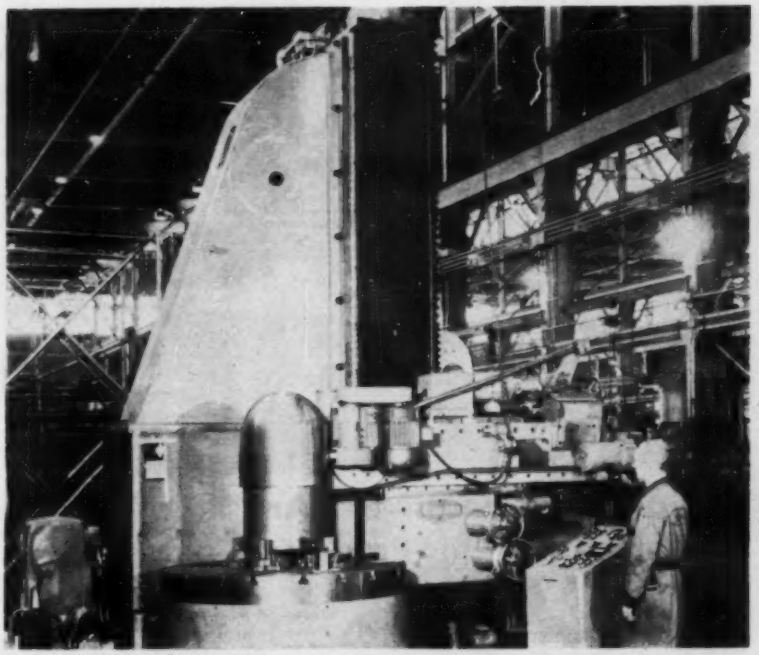
Binks Plastic Spray Unit Mixes Components in Gun

Turbulator spray gun and Formulator storage-metering unit are said to make possible, for the first time, continuous, fast and efficient spray application of polyesters, epoxies, gel-coats, foam-in-place materials and other plastics.

Previously such materials had to be prepared in small quantities and used immediately because the essential elements—activator, catalyst, and resin—harden quickly. The Turbulator provides instantaneous mixing by forcing the elements through high-speed rollers driven by an air motor built into the gun. Formulator unit holds catalyst and activator in one tank, base or resin in the other, and meters and delivers the materials to the spray gun. Price of the system is $8700.

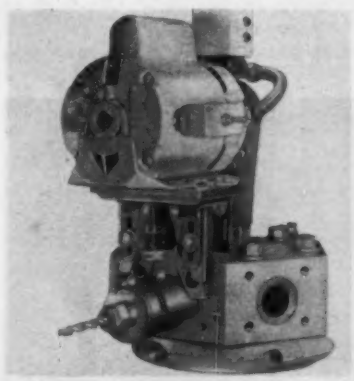
Binks Mfg Co, 3114-44 Carroll Ave, Chicago 12, Ill

MORE DATA? Circle 60, inside back cover



SINGLE-HEAD CONTOUR GRINDER, with tracer control and automatic swiveling, is designed for precision line-contact external surface grinding on missile nose cones and similar workpieces. The machine has a 66-in. table and 8-ft maximum work height and uses a side head instead of a vertical ram head (AM—Dec 14, 59, p149)—*Bullard Co, Bridgeport 9, Conn*

MORE DATA? Circle 61, inside back cover



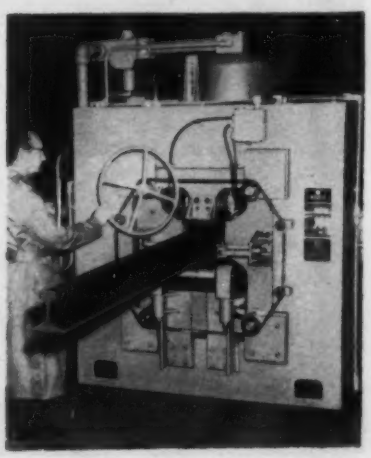
Deep Hole Drilling Attachment Designed for Turret Lathe Use

Deep hole drilling attachment for turret lathes fits into any hole in the turret without interfering with other positions. It has a ⅜-in. capacity in steel with a revolving drill and a 1-in. capacity in steel with a non-revolving drill.

The unit is powered by a 3-hp 1725-rpm motor attached to a timing belt drive that permits speeds of 1150, 1725, 2490 and 3740 rpm. It is designed to fit the following lathes: Warner & Swasey No. 3, 4, 5; Gisholt No. 3, 4; Jones & Lamson No. 3, 4. Cost ranges from $460 to $525, depending on motor and tooling.

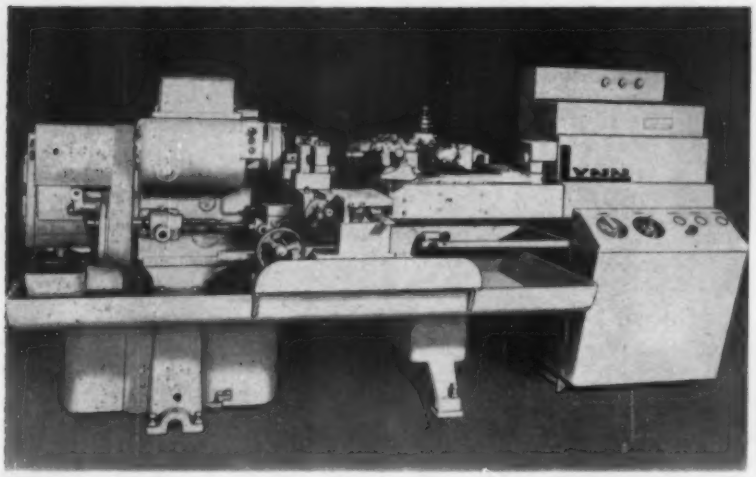
Boyar-Schultz Corp, 2000 S 25th Ave, Broadview, Ill

MORE DATA? Circle 62, inside back cover



HYDRAULIC PRESS which straightens railway rails automatically consists of two 200-ton vertical cylinders and two 80-ton horizontal cylinders—*Hydraulic Press Mfg Co, Mt Gilead, Ohio*

MORE DATA? Circle 63 inside back cover



Hydraulic Drive Converts Any Ram Turret Lathe to Automatic Production Machine

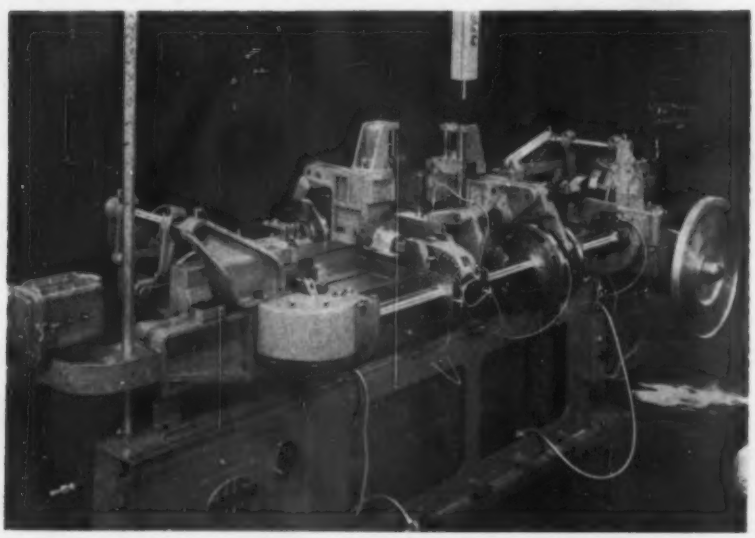
Lynn hydraulic drive, which converts any ram turret lathe to an automatic production machine, provides an automatic cycle for turning, boring, deep hole drilling, facing, undercutting, forming and other operations.

It supplies rapid traverse, feed dwell, reverse feed and rapid return for index and can tap and chase both right and left-hand threads. The drive opens and closes the collet, selects and engages proper spindle speed and operates the cross-slide.

The automatic cross-slide, independent of the operating ram, has a repetitive accuracy of ± 0.0004 in. Accuracy on turret operations is ± 0.001 in. A Reciprocmatic unit drills deep holes and removes chips by automatic reciprocation of the drill. All drives are equipped with a backfeed attachment which provides a finish cut on the return stroke.

Lincoln Industries Co, 1121 S 7th St, Minneapolis 4, Minn

MORE DATA? Circle 64, inside back cover



DUPLEX MULTI-SLIDE MACHINE can be fed coil stock at both ends to fabricate assemblies which could include two stampings and assembly with a prefabricated hopper-fed member, or two entirely different stampings without assembly. It can handle material up to 3-in. wide and has a 6-in. maximum feed length —*US Tool Co, Ampere (East Orange), NJ*

MORE DATA? Circle 65, inside back cover

Standard Subland Drill Line Introduced by Mohawk Tools

New standardized line includes the three basic operational types: 1) Subland Drill-Chamfer for regular taps, fluteless taps, pipe taps, and coil-insert taps; 2) Subland Drill-Counterbore for socket-head cap screws; 3) Subland Drill-Drill for tap drill and body clearance on bolts, studs, and screws.

These drills are available in all practical sizes and combinations in three step lengths and three shank styles.

Mohawk Tools Inc, 920 Main St, Montpelier, Ohio

MORE DATA? Circle 66, inside back cover

A O Smith Offers Two New Welders, Electrode

Premier line of standard ac welding machines in 300, 400 and 500-amp ratings has the transformer laid on its side to make coil movement lateral instead of vertical.

This design innovation is said to reduce cabinet height by a foot to permit three-unit stacking, reduce vibration noise, and cut total handwheel turns from 70 to 15. In addition the machines are equipped with a one-sided brake that eliminates coil creep. Welders measure to 24 in. wide, 30 in. deep, 28 in. high.

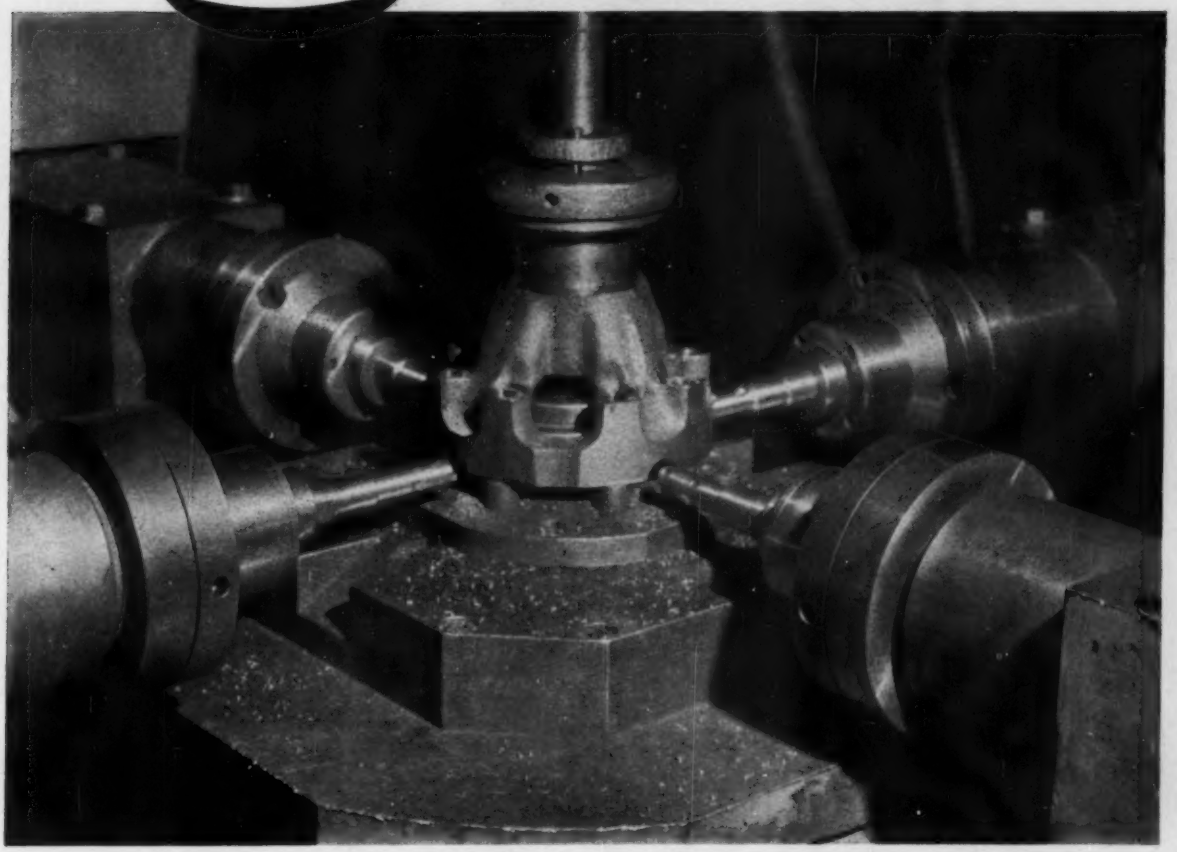
Second new welder is a portable dc machine that features 3500 watts of auxiliary ac power to supply lights, motors and other electrical equipment. DC welding output is 200 amps. The engine-driven Bug also has optional electric starting.

SW 612 electrode is claimed to be more efficient at high currents and cuts spatter loss up to 60%. Other features of the new formulation are a 50% reduction in cleanup time, increased crack resistance, less rejects and easier electrode handling.

A O Smith Corp, Welding Products Div, Milwaukee, Wis

MORE DATA? Circle 67, inside back cover

VR-65 Tungsten-Free Carbide



4 times more production!

The job is rough and finish boring half holes in a C5 steel forging. The machine is a 4 way Cross Bore operating at a speed of 2360 rpm and 700 sfpm; with a feed of .005 and a .025 to .030 depth of cut.

VR-65 tips are brazed to boring tools by conventional methods.

On this interrupted cut, VR-65 produced from 80 to 100 pieces per grind as compared to 10 to 25 pieces by previous conventional tungsten-base carbides.

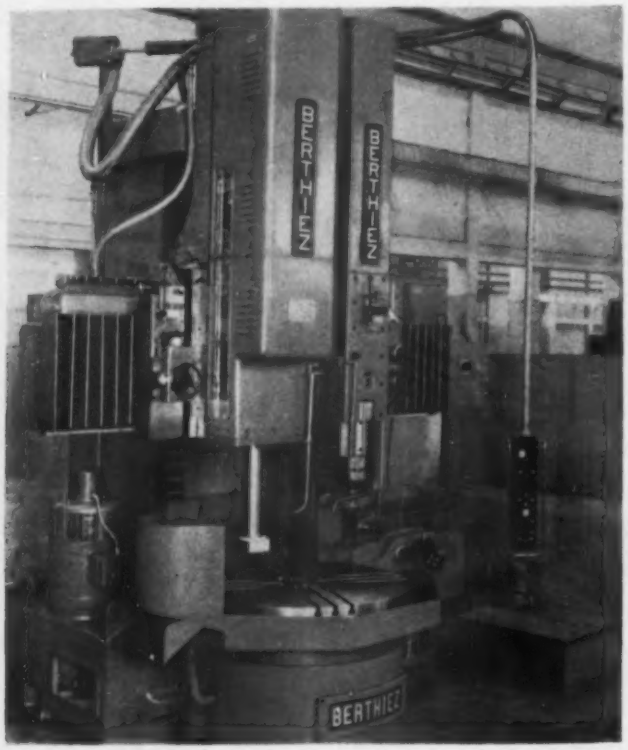
VR-65 is the first of a new generation of carbides to provide ultra high speed machining on *all* types of steel . . . see your V-R representative for details or write:

CREATING THE METALS THAT SHAPE THE FUTURE

VASCOLOY-RAMET

830 MARKET ST. WAUKEGAN, ILLINOIS

C-786



French Vertical Boring and Turning Mill Equipped With Grinding Head on Crossrail

This Berthiez type BM-125 special vertical boring and turning mill, manufactured in France, is basically a standard type BM-125 mill to which a grinding head has been added on the crossrail, making the machine suitable for both turning and grinding operations.

The 54-in. diameter table is driven by a 50-hp dc motor fed by a Ward Leonard set to provide a continuous range of table speeds. The table rests on a large diameter roller bearing. To eliminate bevel gears, the axis of the motor and all the gears in the gearbox are mounted vertically.

The turning toolholder on the crossrail can either be of the turret type or the square ram type. Both the crossrail toolholder and the side toolholder have independent feeds controlled by hydraulically operated sliding pinions.

Mounted on a saddle coupled to the turning toolholder, the grinding toolhead has automatic or manual infeed which can be controlled to within a micron. The spindle is driven by an 8-hp motor through a pair of interchangeable pulleys. Two double-purpose hydraulic pistons control the up-and-down motion of the grinding carriage.

Specifications: 57-in. maximum height under grinding toolhead, table speeds continuous from 1.6 to 160 rpm, 23 horizontal and vertical feeds of the turning toolheads ranging from 0.002 to 0.3 ipr. Turning toolhead on the arm has a 51 in. vertical stroke, 31½ in. horizontal stroke, 30° swivel of ram from vertical. Turning toolhead on the upright has a 51 in. vertical stroke and 23½ in. horizontal stroke of the ram. Grinding toolhead can grind a 54-in. maximum OD and 5¾ in. minimum ID. Its ram has a 2 to 40 ipm continuous vertical speed, 51-in. vertical stroke, 2-in. horizontal micrometric stroke. Manual horizontal spindle displacement is 0.0175 ipr; horizontal automatic feed is 0.0002 to 0.002 in; spindle speed ranges from 1250 to 3600 rpm; maximum grinding wheel size is 12 in., minimum 6 in.

Berthiez, 5 rue Montalivet, Paris 8, France or International Merit Products Corp, 25 Beachwood Ave, Mt Vernon, NY

MORE DATA? Circle 68, inside back cover

Nickel-clad or Copper-clad Molybdenum Offered by GE

Nickel-clad and copper-clad molybdenum sheet metal is available in thicknesses from 0.010 to 0.080 in. up to 4 in. wide. It is expected to be used extensively in semi-conductor products.

According to the manufacturer, clad molybdenum sheet is not subject to blistering, flaking or peeling common to plated sheet when it is punched, formed or processed at high temperatures. It also has improved soldering and durability characteristics.

Standard thickness of the cladding (included as part of the specified thickness) is 0.0005 to 0.001 in. Sheet can be supplied clad on one or two sides and in thicknesses as high as 10% of total thickness.

Lamp Metals and Components Dept, General Electric Co, Nela Park, Cleveland 12, Ohio

MORE DATA? Circle 69, inside back cover

Frameless Nine-Strand Strip Rolling Mill Is 10-ft Long

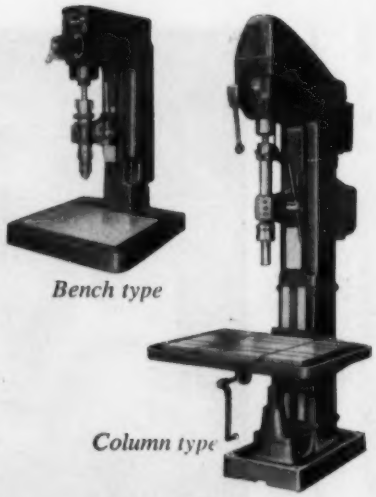
Nine-strand rolling mill only 10 ft long can roll both aluminum and steel strip. Steel strip 2 in. wide can be cold rolled from 0.075 in. down to 0.006 in. Aluminum strip 2 in. wide can be rolled in one operation from 0.125 in. down to 0.009 in. at speeds up to 1000 fpm.

All rolls are mounted in bearing blocks that are pulled together by hydraulic cylinders. Dual synchronized screws are used to push the rolls apart for regulating the gage of the material to be rolled.

This design eliminates the need for roll frames and makes it possible to build a tandem mill with all rolls set on very close centers. Mills can be designed to handle strip up to 12 in. wide. Cost is said to be less than one-third of conventional mills with the same capacity.

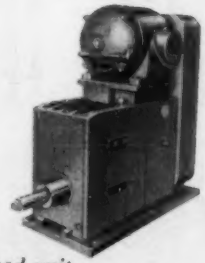
Production Engineering Co, 1795 Massachusetts Ave, Riverside, Calif

MORE DATA? Circle 70, inside back cover

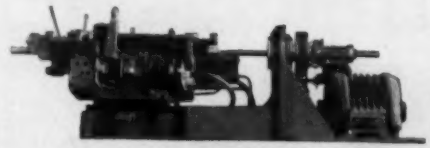


Bench type

Column type



Cam feed unit



Avey-draulic

Avey

drilling, tapping, production machines

The many features of our standard drilling and tapping machines can be combined in more than 100,000 different ways—and one of those combinations exactly meets your requirements.

Capacities in cast iron from very small numbered drills to 2"; No. 32 Jacobs chuck to No. 4 Morse taper.

Six or 8 speeds up to 12,000 rpm; 4 feeds.

Sharp reductions in unit costs, floor space, machine-handling time, and operating time often make our high-production machines smart investments with fast pay-off periods. They have repeatedly proved this in some of the finest automatic lines in the country.

Our standard units can be combined for either rotary or linear operations. They can be economically re-engineered for successive jobs.

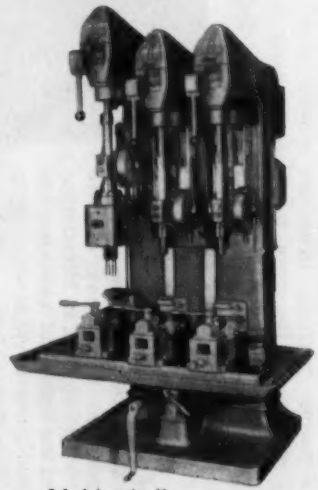
Avey has the right one for Avey makes them all

Column or bench type, with wide range of swing, 1 to 8 spindles.

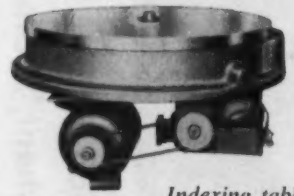
All of our standard drilling and tapping machines include such bonus features as micrometer stop collar, telescoping spindle guard, dynamically-balanced rotating parts, rack-and-pinion-operated motor plate, and our rugged, involute spindle construction.

Tool and die shops like the versatility, accuracy, and speed of our Tool Room machines. They're available with No. 2, 3, or 4 Morse taper. You select the table you need: large (34" x 25"), round (18" diameter), or compound (25" x 12").

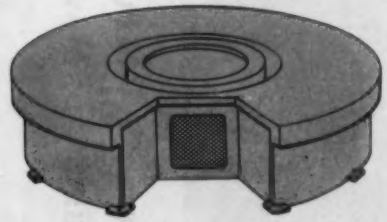
Ask for our literature; or, better yet, ask our representative to help you select the pay-off combination.



Multi-spindle



Indexing table



Standard base

Automatic cam feed units, for drilling, tapping, reaming, hollow milling. Vee belt or gear drive. No. 1, 2, or 3 Morse taper. Mount at any angle. Fully or semi-automatic. Tamper-proof.

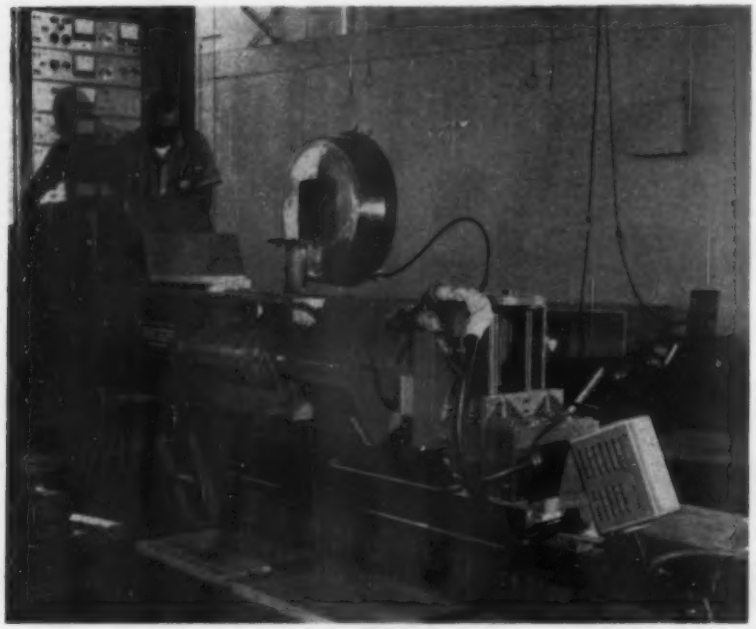
Avey-draulic feed unit. Automatic withdrawal for chip removal only when necessary during deep hole drilling. Rapid advance, feed, and rapid return. Standard strokes 12" up to 30."

Automatic index tables. Rapid, accurate indexing to .001", 3 to 100 stations. Even or uneven index patterns. 16" to 48" diameter.

Steel bases. Stress relieved, sandblasted, machined, and painted to fit your application.

Send us a print of your part, and ask for a profit prediction.

AVEY DIVISION, THE MOTCH & MERRYWEATHER MACHINERY CO., BOX 1264, CINCINNATI 1, OHIO



Automatic TIG Fusion Welder Features Flexibility of Movement, Seam Tracking

Automatic TIG fusion welder of the boom-manipulator type is designed to weld brazed honeycomb and high-heat-resistance heat-treatable alloys for the B-70 bomber program.

Movements include in-and-out weld motions of the main boom, 360° torch rotation, and fine horizontal or vertical head adjustments on the torch face plate. The boom can rotate 360° about the main column and move up and down the same column from 3 to 10 ft above floor level. The main boom can be extended to provide an effective weld length up to 12 ft. Miniaturization of the weld head makes possible internal circumferential welds down to a 20 in. duct.

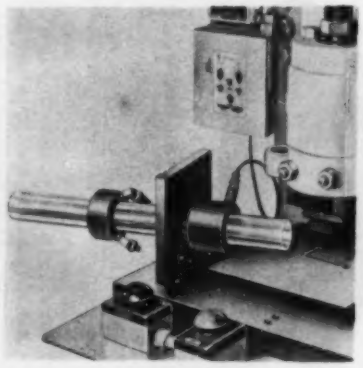
A special seam tracking system is used to maintain alignment of the torch directly over the seam being welded. It is also capable of sensing a butt joint, then tracing over this seam as the head moves. The unit can follow a vagrant seam as much as four inches off an axis in both a horizontal and vertical plane.

The dc power source ranges between 2-300 amps and a feed-back system assures a constant setting. Arc length control is also provided. Special step weld controls change weld settings automatically as material thickness changes.

The operator observes the progress of the weld by closed-circuit TV, in which the camera is mounted next to the welding head and the receiving screen is on the operator's platform.

Sciaky Bros, Inc, 4915 W 67th St, Chicago 38, Ill

MORE DATA? Circle 71, inside back cover



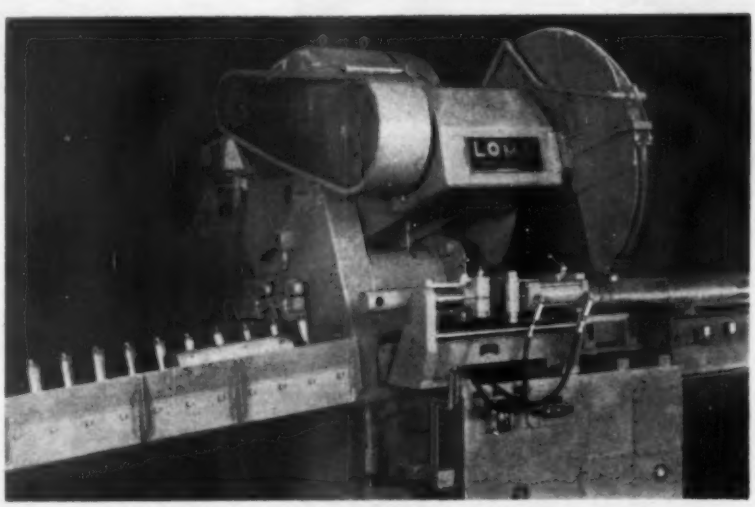
Proximity Switch Press Control Detects Press Malfunction

Proximity switch press control is said to detect press malfunction instantly and stop equipment automatically. It can be used on any press or similar equipment in which a dog, pin or air clutch is either electrically operated or can be modified to electrical operation.

Ferrous or non-ferrous parts passing through or by a detection coil cause electrical impulses which hold a relay contact closed for a pre-set length of time. If a part fails to pass through the coil within this pre-set time interval, the relay opens and the press stops. The unit has a fail-safe high frequency oscillator and electronic timing circuit.

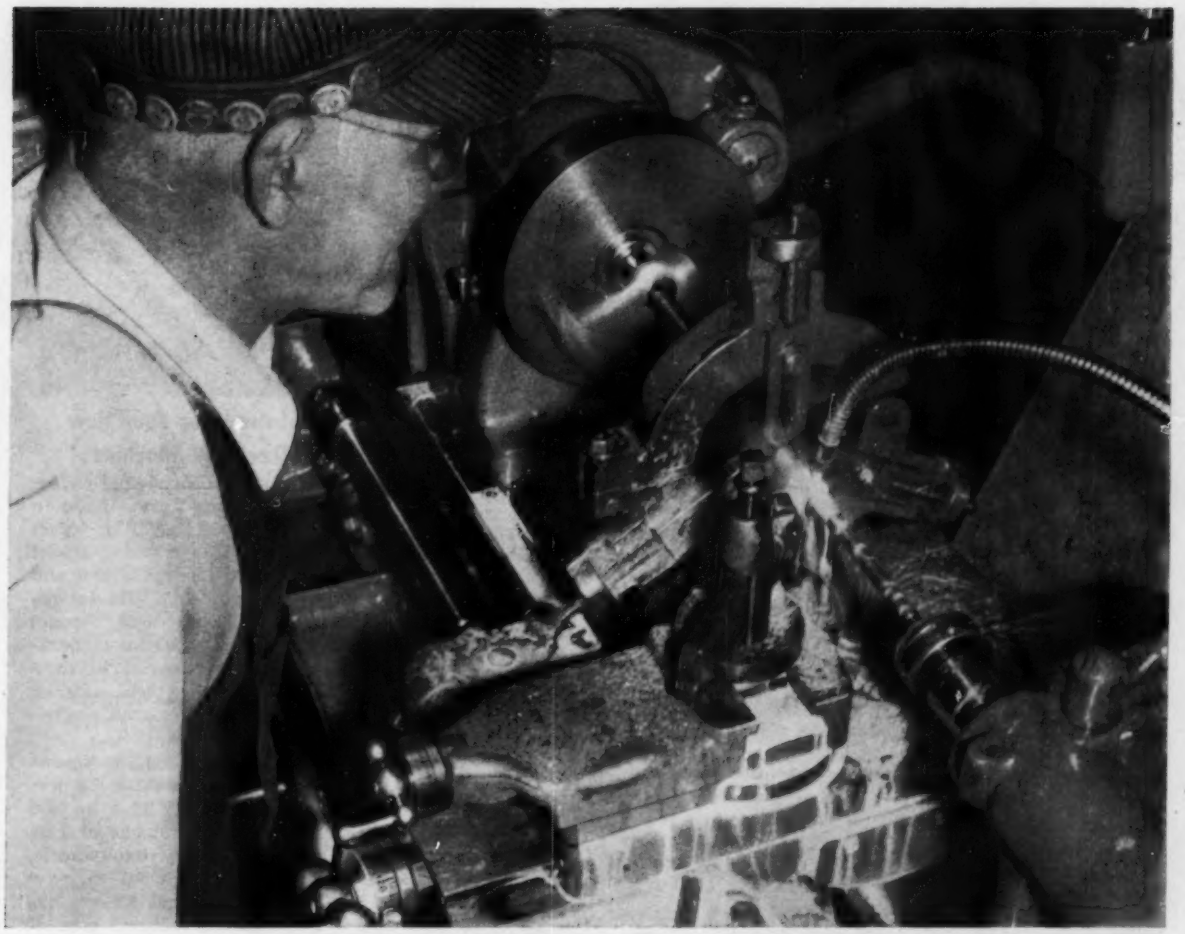
Robotron Corp, 21300 W Eight Mile Rd, Detroit 19, Mich

MORE DATA? Circle 72, inside back cover



HYDRAULICALLY OPERATED CIRCULAR SAW, designed to cut aluminum alloy billets up to 16 in. dia, is equipped with 48-in. dia sawblade driven by a 75-hp motor at speeds between 4000 and 8000 fpm. Sawblade is mounted on a tilt arm which moves downward to make the cut—*Loma Machine Mfg Co, Inc, 114 E 32nd St, NY 16, NY*

MORE DATA? Circle 73, inside back cover

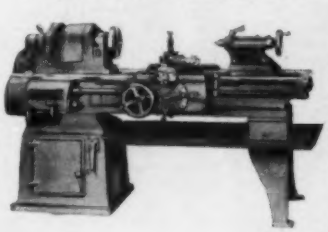


Dependability you can count on / *South Bend 16" engine lathe*

- Ruggedly designed, accurately built to give long trouble-free service.
- Exceptionally accurate—and they stay accurate.
- Microfinished sleeve type spindle bearings for smoother work, longer life, more accuracy, greater spindle support.
- Hardened and ground bed ways for extreme operating conditions available at small extra cost.
- Trouble-free belt drive to spindle—no noise, no vibration, no gear marks.

16" LATHE SPECIFICATIONS

Swing over bed and saddle wings — 16¼". Distances between centers (6 bed lengths) — 33", 45", 57", 81", 105" or 129". Collet capacity — 1⅛" max. Spindle speeds — 6, 8, 12 or 16. Threading feeds — 48 (4 to 224 per in.). Longitudinal feeds — 48 (.0015" to .0841"). Cross feeds — 48 (.0006" to .0315").



Prices of South Bend 16" Engine Lathes start at $2468 f.o.b. factory.

Time payments—3¼% interest per year on unpaid balance, up to 36 months to pay.

SOUTH BEND LATHE

South Bend Lathe, Inc., South Bend 22, Indiana

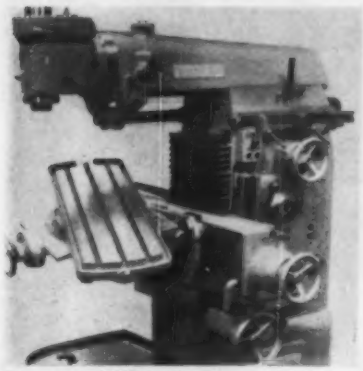
Please send information on lathes, milling machines, shapers, drill presses and pedestal grinders.

Name _____ Title _____

Company _____

Street _____

City, Zone, State _____



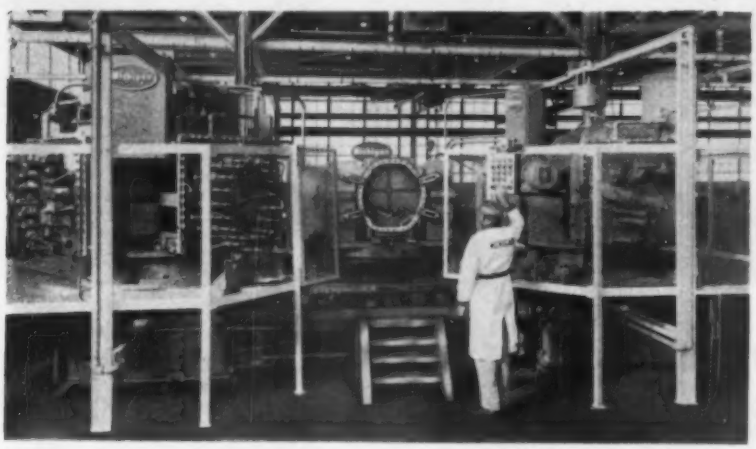
German Miller Features Wide Machining Range

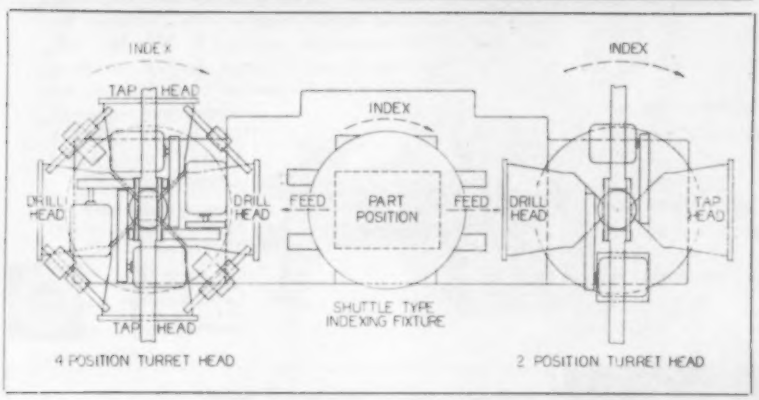
Thiel Duplex 158 toolroom milling machine, made in Germany, is claimed to have an unusually wide machining range. It has a 27½-in. throat depth, 17½-in. maximum distance between table and vertical spindle. The swiveling table tilts 30° in each direction and has a cross-slide movement of 5½ in. Vertical and longitudinal table travel is 16 in. with power feed and rapid traverse in all directions. The horizontal overarm travels 3½ in. in and out by power feed and rapid traverse.

Attachments include dividing heads, rotary tables, slotting head, powered vertical head, 5000-rpm vertical drilling head, universal spiral milling device, jig grinding head and small tooling. Large workpieces may be clamped on the base table and smaller components may be set on either a 33 x 16 fixed table or on the swiveling table.

Dist by United Machine Tool Company of California, 3620 Santa Fe Ave, Los Angeles 58, Calif

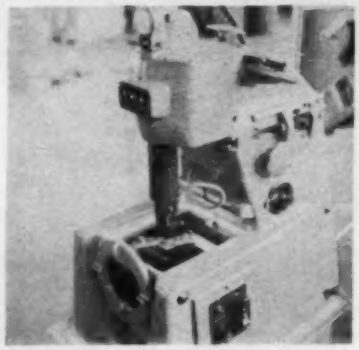
MORE DATA? Circle 74, inside back cover





DOUBLE-END TURRET MACHINE drills, reams, taps, bores, chamfers and spot faces 13 sizes and styles of gas meter bodies at a rate of 10 parts per hour. It has a capacity of 183 spindles (97 drills, 67 taps). Machine consists of a four-station index table at the left, two-station index table at the right and a horizontal feed unit in the center with a three-station index table mounted on its platen. Part is fed into the tools—*Michigan Specal Machine Co, Warren, Mich*

MORE DATA? Circle 75, inside back cover



Wickman Introduces Four New Electrical Discharge Machines

Four new Wickman Erodomatic electrical discharge machines, made in England, are model W/BM bench type machine (illustrated), model W/UV for general purpose tool and die room use, model W/SM for repetitive production, and model W/DM for large die-sinking operations. All machines use Firth-Stirling's Method X by which material is removed by timed-spaced electrical discharge.

Model W/BM has a 230/250-v power supply and is rated at 1.5 kw. Worktable measures 8 by 5 in. and quill has a maximum stroke of 8 in. The slides, moved by handwheels, can be positioned to 0.001 in.

Model W-SM rated at 4.5 kva has a maximum metal removal rate of 0.024 cu in. per minute on coarse setting. It is designed for production use. Fine finish range produces a surface finish of 7 microinches on tungsten carbide. It has a 17½ by 14⅞ in. worktable, 12 in. throat, and 6 in. quill stroke.

Model W/SM rated at 4.5 kva has equipped with automatic servo-controlled electrode feed and rotation and can be used with a rotating, non-rotating or reciprocating electrode. The machine can be setup to produce threaded holes or helical forms in the workpiece. It is rated at 6.6 kva, has a 10 x 7 in. worktable and a 10-in. vertical movement of the workhead with tank and compound slide base in position.

Model W/DM, the largest machine in the line, is designed for forging die production. It can handle die blocks up to 28 in. long, 16 in. wide, and 15 in. deep. The 4.5 kw unit can remove 0.024 cu in. per minute and larger capacity generators can be used to remove up to 0.06 cu in. per minute on roughing cuts.

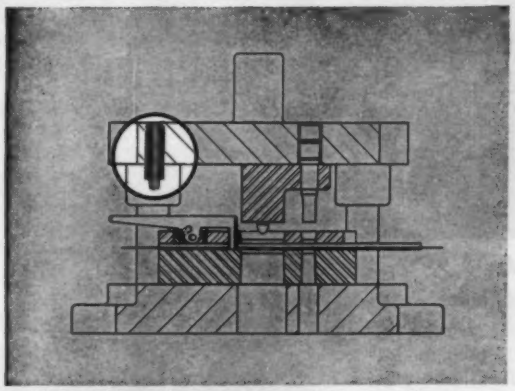
Burleigh and Stocker Machine Tool Co, 23675 Woodward Pl Rdg, Detroit, Mich

MORE DATA? Circle 76, inside back cover

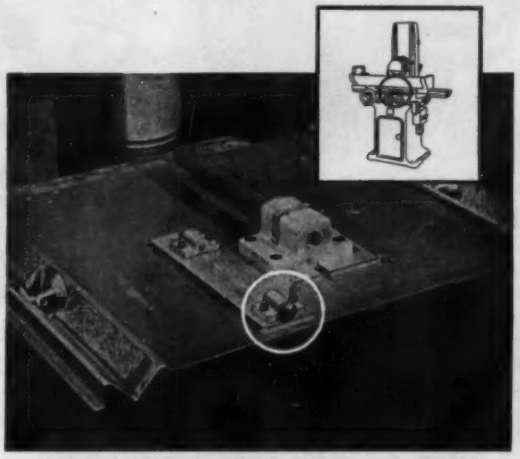
Practical Tooling Tips

Number 2 of a series.

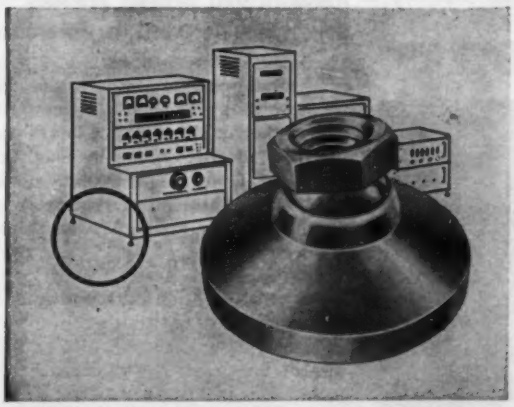
Substituting simple, off-the-shelf Vlier Tooling Accessories for complicated, custom-made devices in both tooling and original equipment applications can result in important savings. Why not put them to work in your plant?



TO STOP SMASHING DIE STOPS, substitute a Vlier Spring Plunger for the usual square-head screw. The plunger actuates the automatic stop perfectly and, unlike the screw, never needs adjusting no matter how many times the die is resharpened. Available in four models: 50 sizes.



TO CUSHION SHOCK as the bed traverses, this surface grinder manufacturer uses two Vlier Spring Stops, reducing wear and tear on the machine. These clever, spring-loaded devices, ordinarily used on fixtures where the absence of side walls prevents the use of spring plungers, are now available in three standard sizes: 3 end pressures. Special sizes made to quantity orders.



TO LEVEL MACHINE TOOLS, electronic racks, benches, etc., use the *standard* Vlier leveling pad. The pad swivels to 7½° each side of the center line; adjusts automatically to uneven surfaces. Unique ball-joint design distributes weight over entire pad surface.

TO GET NEW IDEAS on how to save with Vlier Tooling Accessories, send for new 28-page booklet "Typical Applications of Vlier Tooling Accessories." It suggests dozens of ways to use these time-savers in both tooling and original equipment applications. Write for your copy today.

New catalog now ready! Send for your copy today.

Insist on Vlier Tooling Accessories... there's still no substitute for quality!

VLIER ENGINEERING CORPORATION

A subsidiary of Barry Controls Inc.

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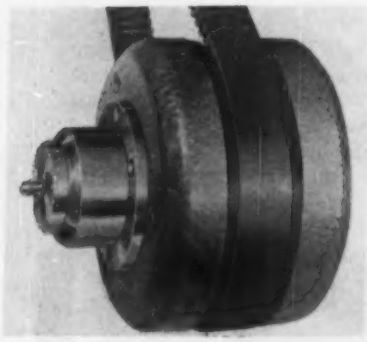


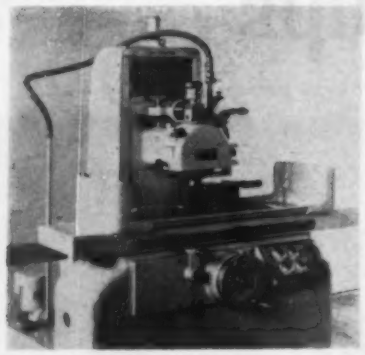
Variable Speed Pulleys Utilize Narrow V-Belts

Five new models, including adjustable motor bases, V-belts and V-belt sheaves, added to the Hi-Lo line of cam-operated pulleys, provide speed ratios of 3:1. They are rated for 1, 1½, 2, 3, and 5-hp motors at 1750 rpm and for ¾ to 3¼-hp motors at 1150 rpm.

Use of narrow V-belts, from ⅞ to 1-7/16-in. top widths, helps to trim operating costs on drives of this range. They can be easily and quickly installed on new or old equipment to provide instantaneous speed changes with only finger-tip pressure while the machine is running. Depending upon pulley model, standard bore sizes are ⅝, ¾, ⅞, 1, and 1⅛ in. with bore lengths from 2½ to 3⅝ in. and motor travel for full speed range 3⅛ to 4 in.

Lovejoy Flexible Coupling Co, 4866H West Lake St, Chicago 44, Ill

MORE DATA? Circle 77, inside back cover



German Surface Grinder Offered in 6x12-Inch Model

ELB (German) surface grinder is now available as a 6x12-inch model with automatic cross feed infinitely variable from 0 to 1¼-in. per stroke. Mechanical table drive operates at 2.5 to 50 fpm. The cross feed is electro-mechanically controlled and can be moved 0.0005 in. per division. Vertical feed can be moved 0.00025 in. per division.

Dist by Aaron Machinery Co, Inc, 45 Crosby St, NY 13, NY

MORE DATA? Circle 78, inside back cover

Two-Flute Thriftmill Added To Brown & Sharpe Line

New Thriftmill is single end with 30° helical flutes, RH cutting. Shank is made same size diameter as cut for greater rigidity and longer life. It is recommended for most conventional end mill operations and is especially suited for profiling, peripheral milling, and general end milling work. It is available in six sizes, ⅛, 3/16, ¼, 5/16, ⅜, and ½ in.

Brown & Sharpe Mfg Co, Cutting Tool Div, Providence 1, RI

MORE DATA? Circle 80, inside back cover

Abrasive Belt Grinder Finishes Honeycomb to 0.001-in. Tolerance

Thickness tolerances of ±0.001 in. can be held on No. 458 conveyorized abrasive belt grinding machine with diamond-shaped head that flexes the belt as it drives. It can be used for finishing honeycomb, sheet stock, small parts and similar high-production flat work requiring critical thickness tolerances.

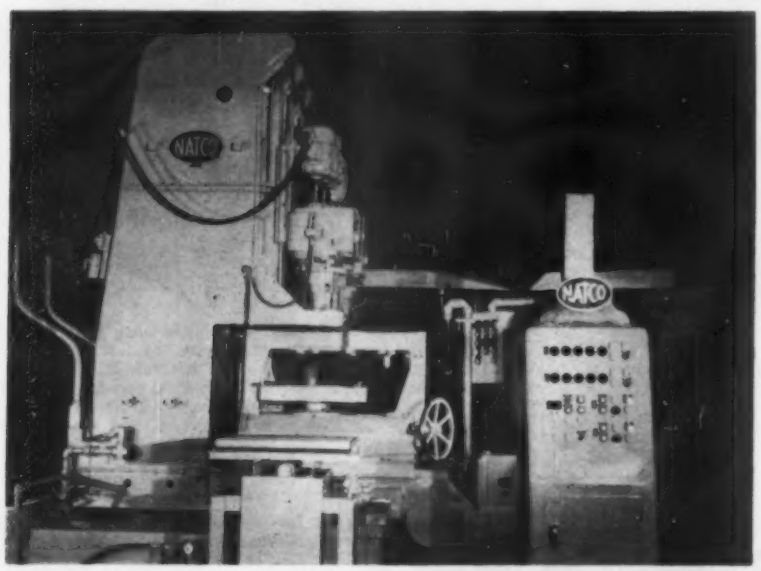
The diamond head design combined with the high-horsepower belt drive provides positive grain penetration. Four rollers in the head flex the belt continuously to keep it clean, cool and free-cutting.

Each of the four rollers has a special function. One roll aligns the belt, one drives it, another supplies grinding pressure. The fourth is an idler that provides additional belt flexing.

Grinder accommodates 36, 48, 60 or 72 in. belts. It can be supplied with single head for reciprocal or single-pass grinding, or with multiple heads and straight-through conveyor. Variable-speed conveyor drive provides a speed range of 6 to 60 fpm.

Mattison Machine Works, Rockford, Ill

MORE DATA? Circle 81, inside back cover



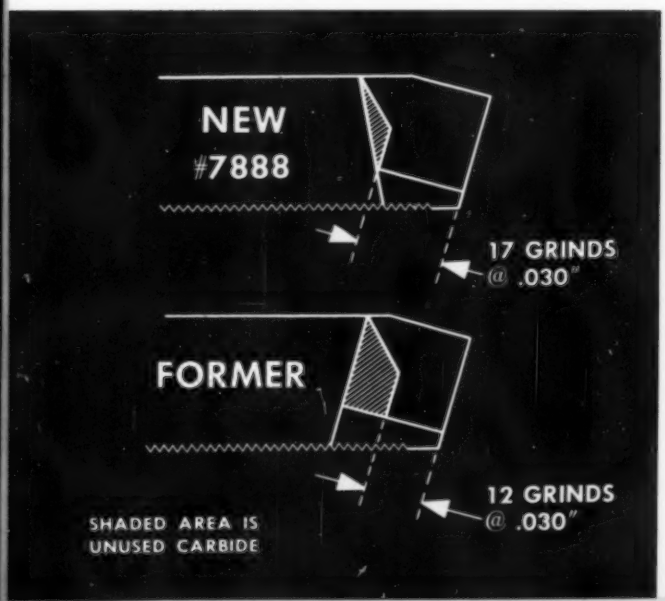
TAPE-CONTROLLED NATCO machines the starter mountings in 160 varieties of flywheel housings in job lots of 50 to 500 of any one design. It bores the starter pinion hole, drills and taps the mounting holes, holds hole locations to ±0.005 in. and turns out a finished part in 3½ minutes—*Natco Automatic Tool Co, Richmond, Ind*

MORE DATA? Circle 79, inside back cover

TOOL NEWS carbide

New WESSON Blade Boosts Life 36%

A new blade which provides an automatic average increase of 36% in blade life when milling such metals as cast iron, aluminum, magnesium or steel is now available for all Wesson Rigidcut series 5200, 5400 and 5500 milling cutters.



Assuming that .030 in. is removed per grind, a total of 17 regrinds is possible with the new design as compared with an average of 12 regrinds on the former blade. There is also less carbide left to be scrapped when the blade is "worn out."

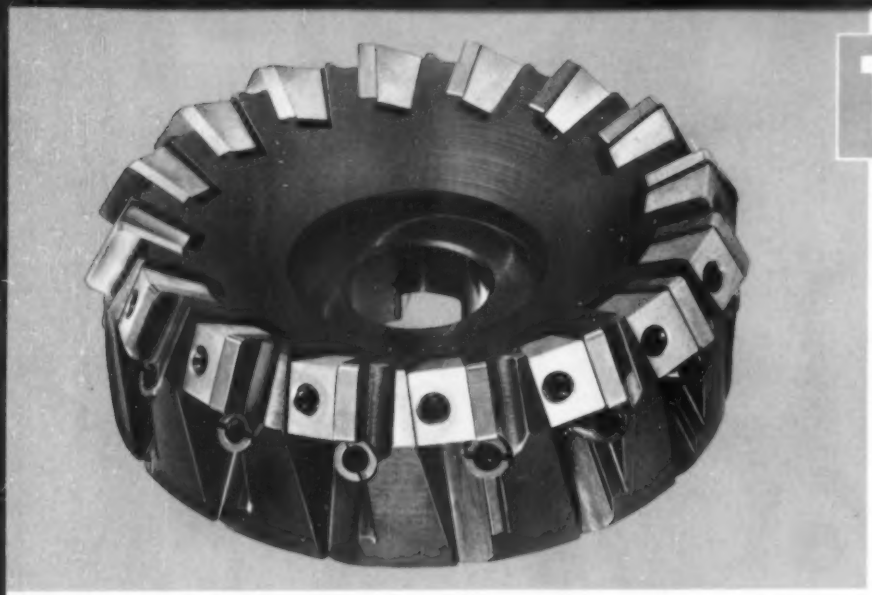
The new blades (series 7888) are being made available by Wesson at no increase in cost and may be used, without change, in existing series 5200, 5400 and 5500 Rigidcut milling cutters.

All three series of cutters are available in cutting diameters ranging from 4 in. to 32 in.

Blades are available for either RH or LH cutters.

More grinds and a minimum of carbide waste when "used up" characterize the new Wesson blade for Rigidcut milling cutters.

FOR FURTHER INFORMATION, CIRCLE READERS' SERVICE CARD A-1



carbide TOOL NEWS

Throwaway Insert Cutters Adjustable for First Time

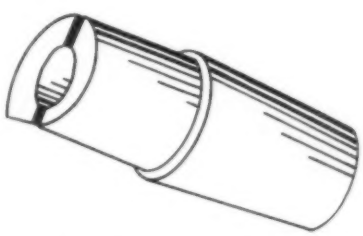
Milling cutters for throwaway carbide inserts with each insert individually adjustable to tenths of a thousandth are now available for the first time. The new development permits the use of throwaway inserts with commercial tolerances without face run-out, and allows cutters to be used for finishing as well as roughing, if desired.

This major breakthrough in the use of throwaway inserts for milling is made possible by an extremely simple device. The axial support for each insert is a cam shaped pin which is taper-locked in position into the cutter body. To advance or retract the insert, a differential screw holding the pin in the cutter body is loosened. The pin is then turned the exact amount desired of insert advance, and the pin is again locked with the screw.

Total adjustment range is .030 in. for each insert, thus allowing for practically any combination of tolerance variations in a milling cutter assembly.

The milling cutter with the new adjustable pin is available as standard in a majority of lead angles and diameters ranging from 5 inches up.

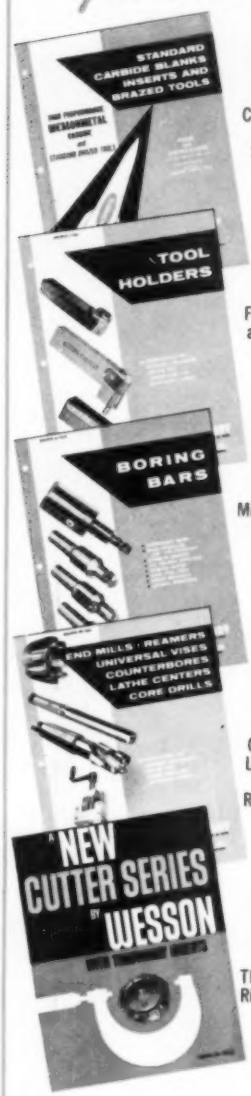
For details, ask for Bulletin #358



To adjust a blade, the blade lock is loosened and the taper lock pin released by turning the screw within the taper lock pin. The pin with its uniform-rise cam seat is then rotated for the desired amount of advance, and pin and blade locks are tightened again.

FOR FURTHER INFORMATION, CIRCLE READERS' SERVICE CARD A-2

Which do you need?



Bulletin MF-260
Complete Prices and Specifications

Bulletin T-160
For Throwaway and Slug Type Inserts

Bulletin B-1259
Micro-Adjustable and Fixed; Single and Multiple

Bulletin MF-360
End Mills, Counterbores, Lathe Centers, Core Drills, Reamers, Vises

Bulletin No. 358
Covering Throwaway and Rigidcut Milling Cutters

All literature requests should be on company letterhead

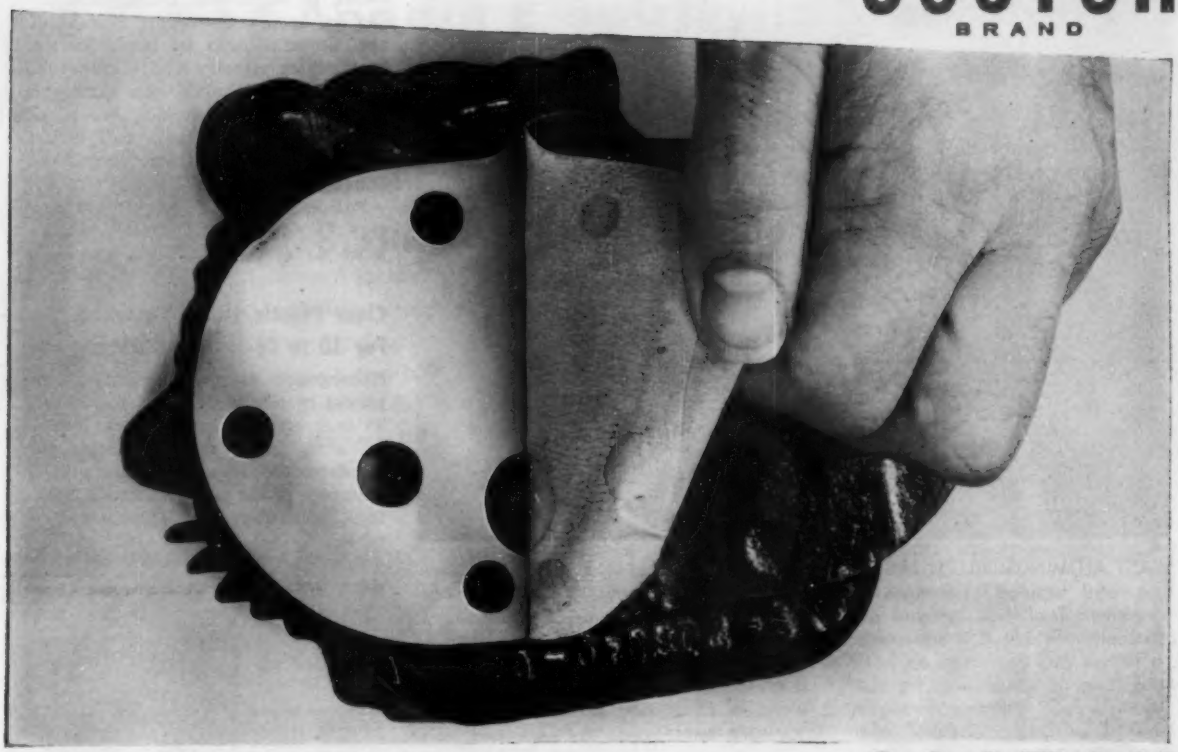
tools Wesson carbide Wessonmetal

WESSON COMPANY, DEPT. AD
1220 Woodward Heights Blvd., Detroit 20, Mich.

IN CANADA:
WESSON CUTTING TOOLS, LTD.
93 Judge Road, Toronto 18, Ontario

LITHO IN U.S.A.

SCOTCH
BRAND



TAPEnology... industry's newest cost-cutting tool

GET PERFECT PAINT JOBS EVERY TIME WITH DIE-CUT MASKS OF TAPE

Cover and protect parts with die-cut masks of "SCOTCH" BRAND High-Heat Masking Tapes during spraying and baking cycles. These economical die-cut masks, shaped to pattern of part, save masking time, labor, and materials—give positive placement for faster, neater finished work.

"SCOTCH" High-Heat Masking Tape's excellent adhesive quality holds fast at bake temperatures up to 350°F—results in clean, sharp-line paint jobs every time—yet tape peels off easily when finished and leaves no residue.

Die-cut shapes of "SCOTCH" Masking Tapes are readily available through your local "SCOTCH" BRAND Tape printer-convertor.

What's your problem? With die-cut masks your 3M representative can help you solve not only painting problems but many others from machining to storage and shipment. Ask your nearest "SCOTCH" BRAND Tape Distributor or write: 3M Company, 900 Bush Ave., St. Paul 6, Minnesota.

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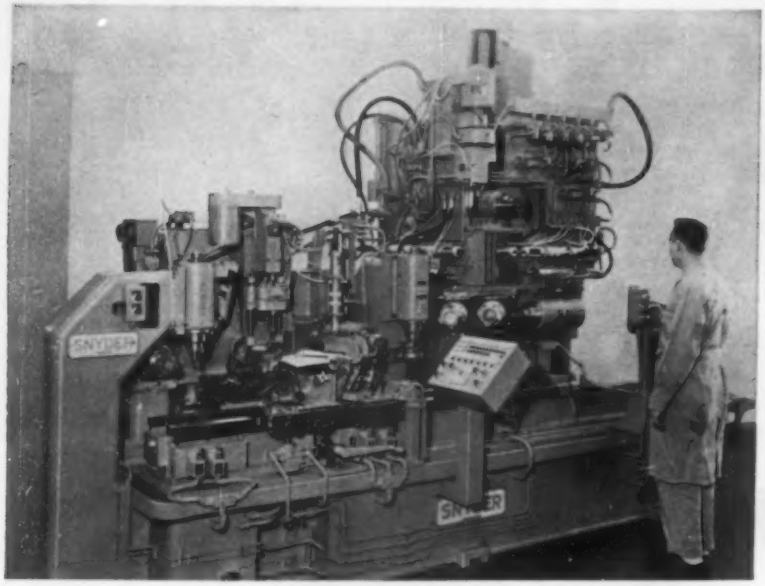
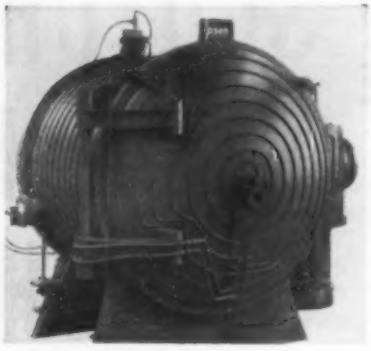


CAST ALUMINUM ALLOY MISSILE WINGS have a wide variety of milling, drilling, and tapping operations performed on them by this new Snyder Programmed Tool that performs at rate of 17 pieces per hr at 100% efficiency. Basically the unit is a line-index type in which the missile wing is clamped in a fixture and traversed on hardened and ground ways to various machining positions. In completing the machining of the part, the work fixture is moved by hydraulic cylinder arrangement along a 68-in.-long path—*Snyder Corp, 3400 E Lafayette, Detroit 7, Mich*

MORE DATA? Circle 82, inside back cover



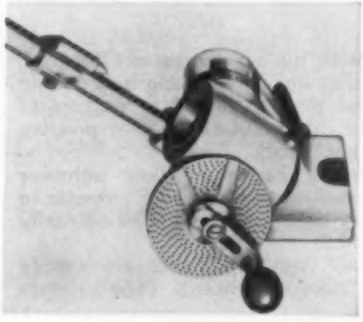
General Purpose Vacuum Furnace Operates at 2600 F

Automatic high vacuum cold wall type furnace, with a work space 26 x 26 x 24 and a 200-lb capacity, can be used for hardening, tempering, drawing and annealing refractory metals, stainless and special alloy steels.

The furnace, series V-5-750, has an operating temperature of 2600 F, a maximum operating pressure of 0.1 micron Hg and takes a power supply of 150 kw per hr. It is charged horizontally and has a molybdenum hearth. Graphite heating elements are used with molybdenum elements optional. Cooling from 2600 to 400 F can be done in less than one-and-a-half hours.

Ipsen Industries, Inc, 721 S Main St, Rockford, Ill

MORE DATA? Circle 83, inside back cover



Dividing Head Speeds Production Of Small Precision Parts

Developed for use in instrument and model shops, unit is designed with minimum overhang, height, and weight which, in addition to attaining maximum rigidity, allows head to be used on rotary tables, milling machines, surface grinders.

Spindle features include 1-in. capacity with use of 5 C collets; concentricity within 0.0002; 360° swing in a vertical plane; and indexing accuracy of one minute of arc. Spindle locks in taper section for greater rigidity and elimination of journal clearance. An outboard center supports slender work at any angle, and use of a ball thrust bearing drawnut gives maximum chucking force.

Falcon Machine & Tool Co, 209 Concord Turnpike, Cambridge, Mass

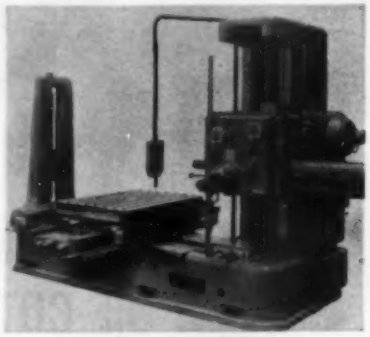
MORE DATA? Circle 84, inside back cover

Clear Plastic Shield Designed For 30 to 36-in. Metal Shears

Shearguard made of ¾-in. transparent plastic is designed for 30 and 36 in. metal squaring shears. The 4-in. wide guard extends across the front of the shearing knife and is fastened to the two side blade housings, ⅜ in. above the top of the shear table.

Brett-Guard Corp, Englewood, NJ

MORE DATA? Circle 85, inside back cover



German Boring Mill Has Roller Bearings in Spindle Head Housing

Wotan table type boring mill, made in Germany, has 3½-in. diameter spindle and a 31½-in. boring depth. It can be used for boring, milling, facing and thread cutting. There are 21 spindle speeds from 9 to 1000 rpm and 27 feeds from 0.001 to 0.500 in.

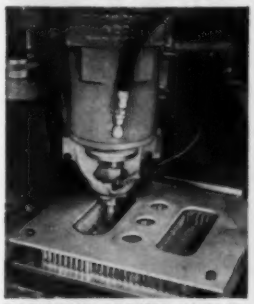
Special feature is the arrangement of the spindle sleeve with built-in double row cylindrical roller bearings mounted in the spindle head housing. Head feed and table cross feed can be operated simultaneously, are reversible independently and combined for a feed motion that is inclined 45° in either direction. The operator can position spindle, spindle head, table and carriage and read the amount of all movements on the capstan dial.

Dist by Index Industrial Corp, 660 Madison Ave, NY 21, NY

MORE DATA? Circle 86, inside back cover

PROGRESS REPORT

NOW Anocut Electrolytic Machining for CAVITY-SINKING as well as ROTATING-WHEEL applications

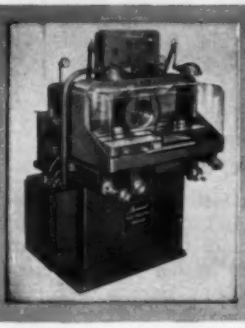


MACHINING POCKETS IN FRAGILE STAINLESS STEEL HONEYCOMB FREE OF LAYOVER AND BURR. PHOTO COURTESY EKSTROM, CARLSON & CO.

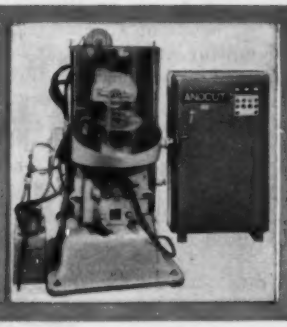
Rotating-Wheel Anocut

is used for metals which are (1) hard, (2) tough, (3) heat sensitive or (4) easily burred wherever an open surface is to be machined to high accuracy and high finish. It will produce surfaces which are flat or curved (inside or outside) or continuous forms, as in form grinding. Wherever a rotating wheel can be applied this method offers tremendous savings in time and abrasive cost.

MOUNTING STATOR RING FOR ELECTROLYTIC MACHINING OF VANE TIPS TO ACHIEVE PRECISE CONCENTRICITY AND SIZE. OPERATION IS FAST AND ELIMINATES DEBURRING, SAVING LABOR COSTS AND REDUCING SCRAP.



MODEL EG-12 ELECTROLYTIC OSCILLATING GRINDER WITH TWO AIR-OPERATED TILTING TABLES. DESIGNED FOR PRODUCTION WORK ON FLAT SURFACES OF JET ENGINE AND ROCKET ENGINE COMPONENTS AND OTHER TOUGH OR HARDENED STEEL PARTS, DOVE-TAIL OR CIRCULAR FORM TOOLS, ETC. PHOTO COURTESY HAMMOND MACHINERY BUILDERS, INC.

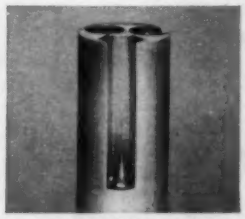


AUTOMATIC ELECTROLYTIC FACE MILL GRINDER. VARIABLE SPEED MOVABLE RAM CAN BE ADJUSTED TO SHARPEN COMPLETE CUTTER IN ONE REVOLUTION OF TABLE, REMOVING .005" TO .020" FROM EACH TOOTH. FORTY-FOUR TOOTH CUTTER, 16" DIAMETER, SHARPENED IN 22 MINUTES, REMOVING .012" FROM EACH TOOTH, GRINDING CARBIDE AND STEEL SIMULTANEOUSLY. PHOTO COURTESY OLIVER INSTRUMENT CO.

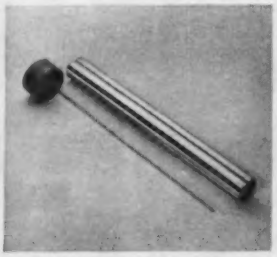
NEW MACHINE - SAME PRINCIPLE

Plunge-Electrode Anocut sinks a shaped electrode into hard or tough metals by the same electrochemical principle as rotating-wheel Anocut. Unlike electro-discharge spark machines it has high removal capacity, no electrode wear, and is therefore intended for repetitive production jobs.

MODEL HCS-59 ELECTROLYTIC CAVITY-SINKER. APPLIES SAME BASIC ELECTROLYTIC PRINCIPLE TO THE SINKING OF IRREGULAR HOLES AND SHAPES FOLLOWING THE CONTOUR OF THE ELECTRODE MADE FOR THE PURPOSE. THE ELECTRODE IS SIMPLY PLUNGED LINEARLY INTO THE WORK MATERIAL.



HEXAGONAL HOLE 1" DEEP, ¼" ACROSS FLATS, IN UDIMET 700. NOTE STRAIGHTNESS AND SHARPNESS OF WALLS WHERE ELECTRODE BROKE THROUGH. CONICAL TIP IN BOTTOM OF BLIND HOLE CAN BE ELIMINATED. INTERIOR-COATED ELECTRODE USED FOR ROUND HOLES IN BACKGROUND.



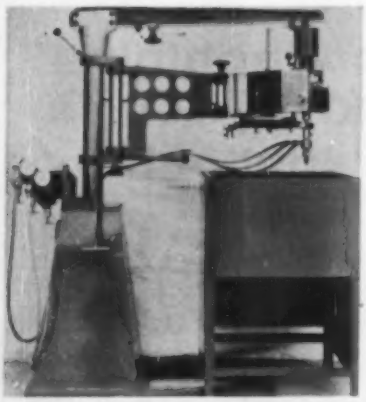
SEVEN INCH LONG, .078" DIAMETER HOLE ELECTROLYTICALLY "DRILLED" IN UDIMET 700. ROD HAS BEEN SURFACE GROUND TO EXAMINE STRAIGHTNESS OF HOLE. NO WEAR ON ELECTRODE.

ELECTROLYTIC TREPANNING. DESIRED FORM EXTENDS INTO INTERIOR OF SHAPED ELECTRODE. NOTE HIGH FINISH ON BLADE FORM.

ANOCUT T.M. Reg.

ENGINEERING COMPANY

631 WEST WASHINGTON BLVD. • CHICAGO 6, ILL. • PHONE STATE 2-5480



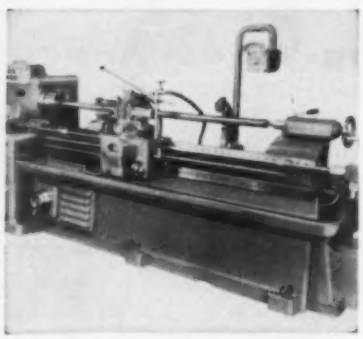
Oxygen Cutting Duplicating Unit Cuts 4-in.-Thick Iron Plates

Fully automatic machine is designed for individual or batch cuts of profile sections. Cuts may be made from iron or steel templets to a line drawn on the plate itself or by means of an automatic circular cutting attachment. It is used in cutting profile sections from iron plates ⅛ to 4-in. thickness; length of cut, 60 in.; circular, 1½ to 40 in.

Cutting gas and oxygen are conveyed separately to the torch head and mixed there. Unit operates normally with acetylene; it can also be used with hydrogen, propane, illuminating gas, or any other gas specified. Head is mounted on a pantograph, mounted on a single pillar; cutting table is separate and portable.

Milo Mfg Co, 259 N Broad St, Elizabeth, NJ

MORE DATA? Circle 87, inside back cover



Automatic Threading Lathe Measures 84-in. Between Centers

Model 3L automatic cycle threading lathe, made in Italy with US electricals and bearings, has an 80-in. stroke and measures 84 in. between centers. It features a geared head and a 25% increase in horsepower. According to the manufacturer, the lathe can thread a six-and-a-half-foot lead screw in less than 30 minutes.

It threads internally and externally with a series of passes in which spindle speeds, feeds and number of passes are preselected. Maximum swing is 24 in.; maximum spindle bore is 16 in. With attachments, tracing, facing, turning, cutoff, chamfering, shouldering, boring and threading can be done in one chucking.

Dist by Man-Au-Cycle Corp of America, 140 53rd St, Brooklyn 32, NY

MORE DATA? Circle 88, inside back cover

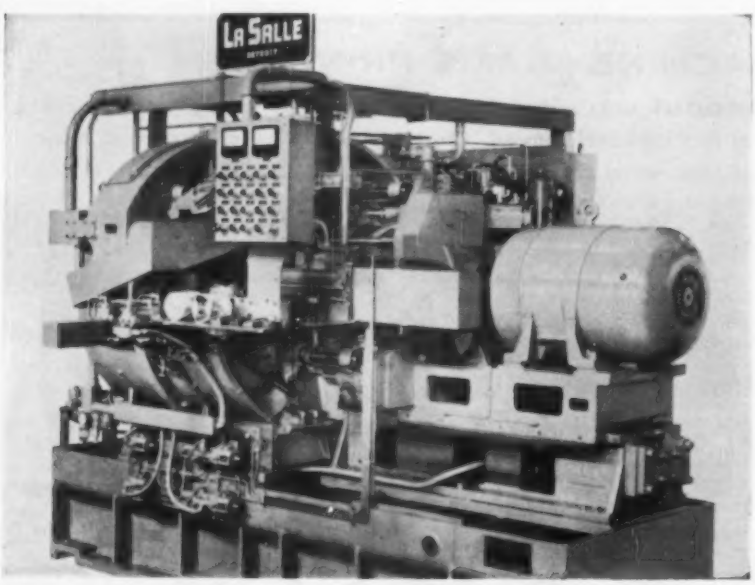
Vertical Clinometer Said To Be Simple, Inexpensive

Vertical clinometer, said to be simple to operate and relatively inexpensive, determines or sets vertical angles up to 180° either side of vertical to accuracies of 1 minute or 30 seconds of arc.

It consists of a 4-in. vertical circle graduated to either 30 or 20 minutes and a vernier with adjustable reading glass. A leveling bubble sensitive to 60 seconds is mounted on the circle with a tangent screw for minute adjustments.

Buff and Buff Mfg Co, 329 Lamartine St, Jamacia Plain, Mass

MORE DATA? Circle 89, inside back cover



SIX-STATION TRUNNION TYPE MACHINE, requiring only 108 sq ft of floor space, processes pistons for trucks, marine engines and heavy-duty equipment at a rate of 514 pieces per hour. Operations are: center drill the dome end; drill, chamfer and ream two process holes in the weight boss; face the weight boss for locating purposes—*LaSalle Machine Tool, Inc, 3840 E Outer Dr, Detroit 34, Mich*

MORE DATA Circle 90, inside back cover

Browning Announces New Bearing Units

New line of relube type bearing units includes high and low height pillow blocks, two and four hole flange units, and takeup units. Units are generally available in 29 shaft sizes from ½ to 2 7/16 in.

Tapered roller bearing flange blocks in shaft sizes of 1 3/16 to 2 15/16 in. have been added to the 900 series of tapered roller pillow blocks. All these units are equipped with tapered roller bearings, eccentric locking collers, malleable housings and Centrap grease seals.

Browning Mfg Co, Maysville, Ky

MORE DATA? Circle 91, inside back cover

CLAUSING COLCHESTER GEARED-HEAD LATHES

Clausing-Colchester 13″, 15″ and 17″ lathes are by long odds the greatest values in lathe history. Note the following outstanding superiorities and rock-bottom prices:

● **WORLD'S FINEST MACHINE TOOL BEARINGS** . . . Tapered roller bearings with oil-flow lubrication. Just look at the size:

LATHE	17″	15″	13″
FRONT SPINDLE BEARING O. D.	7½″	5½″	4″

● **CIRCULAR ACCURACY OF EVERY LATHE IS GUARANTEED TO BE WITHIN .0001"!**

● **BIG SPINDLES WITH LARGER THRU-HOLE CAPACITY:**

LATHE	17″	15″	13″
THRU-HOLE	3″	2″	1½″
NOSE TAPER KEY DRIVE	L-2	L-1	L-0

SEE US AT BOOTH 1931
A.S.T.E. SHOW, DETROIT.

● **INDUCTION-HARDENED BED WAYS** . . . Standard equipment at no extra cost!

● **ALL-GEARED HEADSTOCK** . . . Gears are induction hardened.

● **OIL BATH LUBRICATED HEADSTOCK and QUICK CHANGE GEAR BOX** . . . both totally enclosed.

● **SEPARATE FEED ROD FOR POWER FEEDS** . . . Lead screw is used for thread cutting only.

● **LOWEST PRICES** . . . The Clausing-Colchester is the biggest lathe value you can find anywhere! The 13″ straight bed model starts at $2302; 15″—$3221; 17″—$5070. Gap bed models are available in all three sizes. *Prices include 2-speed motor and American electricals.*

Get all the facts. Compare Clausing-Colchester with any other lathes of comparable size . . . feature for feature, dollar for dollar. Prove to yourself that Clausing-Colchesters are truly the "Greatest Values in Lathe History" . . . *the* lathes for *your* shop!

Write for Free Literature

CLAUSING COLCHESTER

CLAUSING DIVISION
ATLAS PRESS COMPANY
5-101 N. PITCHER ST. • KALAMAZOO, MICH.

Unit Converts Surface Grinder To Rotary or OD Grinder

Rotary grinding table unit, called Rodex, converts a surface grinder to a rotary or OD grinder and uses a permanent magnet chuck to minimize the need for clamping.

The 11-in. diameter table may also be used as an index table for milling and drilling by cutting out the motor and using positive location on gear keys. Overall height without 3-jaw chuck is 3 in. It is powered by either 110-v ac for speeds of 5 to 90 rpm or dc with variable speed drive of 1 to 90 rpm.

Eight Mile Industries, Inc, 21290 W Eight Mile Rd, Detroit 41, Mich

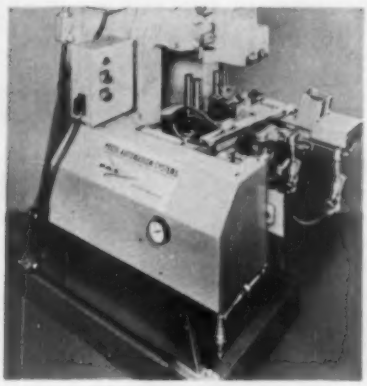
MORE DATA? Circle 92, inside back cover

Dayton Safety Cutoff Wheels Offered in New Line

Wheels, designed for all types of high-speed production cutting, are available for all makes and models of cutoff machines and for both wet and dry cutting operations. Line includes resinoid, resin-rubber and rubber, reinforced and non-reinforced straight cutoff wheels in thicknesses from 1/32 to ¼ in. Resinoid, resin-rubber and all reinforced wheels are available in diameters up to 20 in.; rubber, up to 26 in. They are manufactured of aluminum oxide and silicon carbide abrasives in various combinations and grain sizes.

Simonds-Worden-White Co, 1101 Negley Pl, Dayton 7, Ohio

MORE DATA? Circle 93, inside back cover



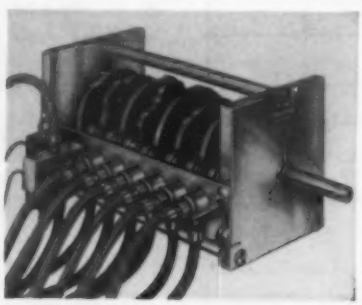
Packaged Feeder Unit Automates OBI Presses

Packaged, plug-in feeder unit that automates open-back inclinable presses can feed parts into dies at rate of 40 to 60 pieces per minute.

The air powered unit mounts on the side of a press and has an arm that travels back and forth to pick up parts from a preloaded station and place them in the die. Vacuum-lift, electromagnets or gripper fingers are used to pick up the parts. The parts are removed from the die by air ejection or similar automatic unloading means.

Press Automation Systems, Inc, 25418 Ryan Rd, Warren, Mich

MORE DATA? Circle 94, inside back cover



Electrical Sequence Programer Equipped With Eight Cam Cuts

Pneumatic-electrical Minimatic programing unit, measuring 7⅛ by 3¾ by 4 in., is designed for precise control of automatic tooling and work operations. Units are supplied with choice of eight easily altered standard cams which are said to fill the majority of automation requirements.

Special cams with degree of rotation cuts other than standard are also available. Unit can be driven by any power source supplying a minimum of 10 inch-pounds of torque. The ⅜ in. steel shaft may be extended out both ends for tandem operations and end plates are tapped for bottom or rear mounting.

Clippard Instrument Laboratory, Inc, 7390-P Colerain Rd, Cincinnati 39, Ohio

MORE DATA? Circle 95, inside back cover

Motor Controller Features 300% Increase in Surge Safety Factor

Motor controllers in models to handle 1/100 to 1¾-hp motors use high temperature silicon rectifiers to provide a 300% increase in surge safety factor.

The units operate on 115-v 60-c power and provide adjustable dc voltages for driving dc shunt motors. Regulation is approximately ±4% of base speed and speed range is 50:1.

Magnetic Amplifiers, Inc, 632 Tinton Ave, NY 55, NY

MORE DATA? Circle 96, inside back cover

Die Protection Device Operates Directly on Press Clutch

Di-Matic Press Control is an electrically controlled die protection device that instantly disengages the press clutch at the exact moment the material in the die should mis-

Order bearing bronze in any lengths up to 105", diameters up to 9"

ASARCON 773 (SAE 660)
CONTINUOUS-CAST BRONZE

Asarcon 773 can cut your replacement bearing costs many ways. Buying only the lengths you need means no short-end scrap. Your choice of diameters up to 9" reduces diameter loss—only 1/32" to 3/32" to machine off. Every Asarcon bar is unconditionally guaranteed to be free of blow holes, pits, or sand inclusions. No shrinks; no hard or soft spots. Better, more uniform properties. Order Asarcon 773 from stock in 260 sizes, solids, and tubes, from a national network of distributors. Write for address of nearest stock point, and complete data, to Continuous-Cast Department, American Smelting and Refining Company, Barber, N. J. or Whiting, Ind.

ASARCO

AMERICAN SMELTING AND REFINING COMPANY

CONTINUOUS CAST DEPARTMENT

West Coast Distributor: Kingwell Bros., Ltd., 457 Minna Street, San Francisco, Calif. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal. Distributors in many principal cities.

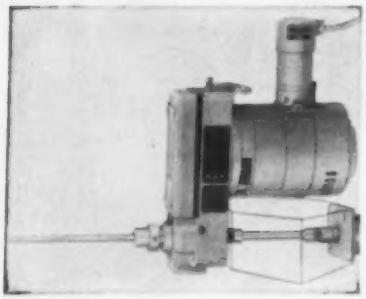
CIRCLE 251 READER SERVICE CARD

feed, buckle, pile up, or come to an end. Unit operates directly on any kind of clutch, either mechanical or air-friction.

Accessories available enable mechanical clutches to be controlled by electric pushbuttons including the change from single-trip to continuous-run; detect missing parts in the various stations of a transfer press; remotely control any electrical device timed with the run-stop motion of the press ram.

Diecraft Tool Co, 100 Beadel St, Brooklyn 22, NY

MORE DATA? Circle 97, inside back cover



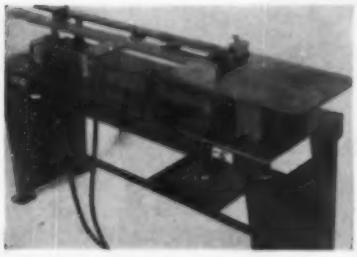
Gun Drilling Unit Can Be Mounted on Turret Lathes

Model 3-203 gun drilling unit can be installed on ram or saddle type turret lathes. It has a ¾ in. bore spindle and accommodates gun drills from 3/16 to ⅝ in. diameter.

The gun drill can be run at spindle speeds of 765, 1150, 1405 and 2110 rpm. There is a high pressure coolant stream, 300-400 psi for large drills and 500-600 psi for small drills, to wash out chips through the single straight flute of the gun drill. Overhang of the unit is only 6½ in.

Ward-Riddle Co, 241 Myrtle St, Ravenna, Ohio

MORE DATA? Circle 98, inside back cover

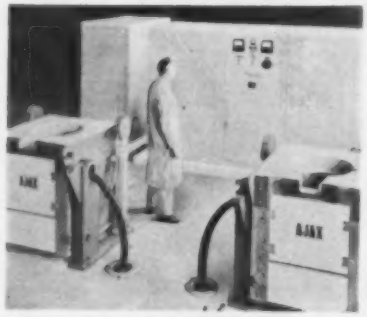


Wire Rod and Strip Metal Bender Bends 2000 (¼-in.) Wires per hr

Model AB3.5 can bend up to ½-in. cold rolled bar or multiple of smaller diameter wire. Features of the air-operated unit include adjustable gages; tool tray in base; adjustable side platform for bending frames; extension tables available with disappearing stops.

Lubow Machine Co, 262 Mott St, New York 12, NY

MORE DATA? Circle 99, inside back cover



Device Converts Frequency For Induction Heating Use

Multiductor Static Frequency converter is said to be a lowcost, efficient method of converting frequency for induction melting and heating applications.

The Multiductor takes three-phase 60-c power from an ordinary line and delivers single-phase 180-c power. Output may be varied, continuously and under load, between zero and 30-40% over nominal rating.

Models range from 100-1000 kw and units can be paralleled for larger power requirements. They will operate off supply line ranging from 440 to 4800 v.

Ajax Magnethermic Corp, PO Box 839, 3990 Simon Rd, Youngstown 1, Ohio

MORE DATA? Circle 100, inside back cover

SHEET AND PLATE WORKING MACHINE, Swedish-made Metal Worker, type Junior, has edge-cutting capacity in mild steel of 5/32 in., throat depth of 28½ in.—*Dist by Homestrand Machine Tool Corp, 392 W Putnam Ave, Greenwich, Conn*

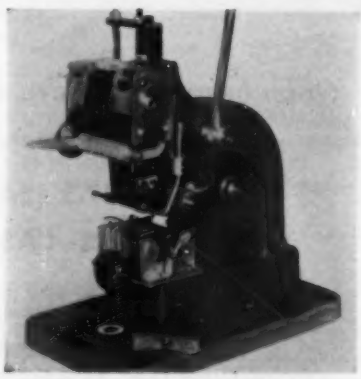
MORE DATA? Circle 101, inside back cover

Constant Potential dc Welder Introduced by Miller Electric

Model CP-3-VS reportedly makes X-ray perfect MIG welds on aluminum, magnesium, stainless and carbon steel sheets down to a thickness of 0.030 in. New model is also said to provide continuous slope and voltage adjustment while welding between the limits of 300 amp at 30 v and 25 amp at 10 v. Both spatter and burn-through are eliminated, according to manufacturer.

Miller Electric Mfg Co, Appleton, Wis

MORE DATA? Circle 102, inside back cover



Wire and Tube Marking Machine Handles 1/16 to 1¼-in. Diameters

Model HWM-2 lever-operated wire and tube marking machine handles wire sizes AN-26 to AN-0000 and tubing from 1/16 to 1¼ in. OD.

Replaceable typeholders hold up to 1½ in. of type. The stamping depth is adjustable and will not creep from its setting. Heat range is 100 to 600 F. The unit may be supplied with a flat anvil or fixtures for hot stamping small parts, monogram work or other applications.

Automark, 1920 S Vanderventer Ave, St Louis 10, Mo

MORE DATA? Circle 103, inside back cover

MATTISON
HIGH-POWERED PRECISION

GRINDING METHODS

Only efficient method for abrasive belt grinding and polishing ID's of long tubes

The Mattison tube grinder and polisher can rough-grind oil line casing or pipe ID's for efficient stock removal, or polish tube interiors to a pit-free No. 4 finish. It can take down welding seams on stainless tubing of only 5/8" ID, or rough and finish-grind 9" OD tubes up to 50 feet long.

In roughing work, the Mattison No. 424 uses 60 or 80-grit aluminum oxide belts to remove up to .003" per pass. Cloth-back belts of 120 or 150-grit silicon carbide put the required fine polish on interiors of tubes used for dairy, drug, and food handling.

Expandable head polishes tube ID's to as fine as 4-5 microinches

In operation, long tubes are clamped into rubber-face supporting and drive rolls. These revolve the tubes for rapid, accurate grinding while the abrasive belt feeds at rates up to 6500 surface feet per minute.

In only a few minutes, the operator threads the belt through the tube—abrasive side out—then splices it to form an endless belt. On high-production work, a helper can thread and splice belts through tubes in a loading platform while the operator concentrates on the grinding operation. Tube and belt can be loaded in one setup.

Grinding occurs when a 1/4 hp motor-driven hollow ramrod reciprocates an expandable head through the tube. Compressed air is forced through the ram. This expands the grinding head, forcing the belt against the tube ID. Stock is removed where the traveling head presses the belt against the tube ID. You can produce finishes as fine as 4-5 microinches.

Automatic belt tension and variable feeds assure maximum production

The abrasive belt passes around a pulley on the 25-hp driving motor at one end of the machine and around an idler roll with pneumatic tensioning device at the other end. An air pressure regulator quickly adjusts belt grinding pressure for your desired finish on stainless and alloy steels, carbon steel, bronze, brass, and composition—seamless or welded.

Speed of tube revolution on drive rolls can be co-ordinated with belt grinding pressure for best production rate and surface finish on individual pieces. Rotation of tubes and variable speeds of the ram are regulated through multiple-groove sheaves, which give you four speeds each. Automatic trips are easily set to start reversing action, according to tube lengths.

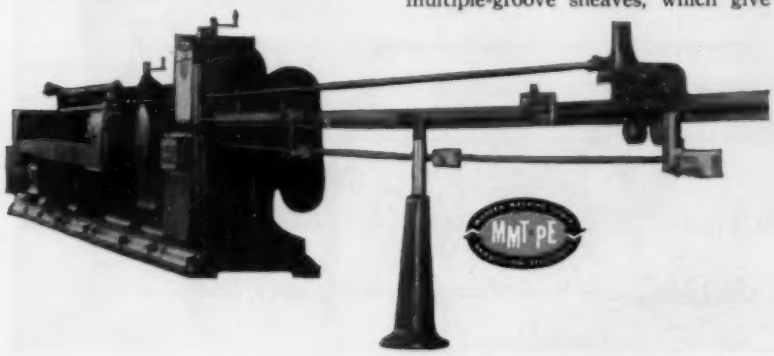
A water spray cools tubes to permit fast grinding without overheating and softening the metal. Water troughs and sprays will accommodate various lengths of tubes being ground.

Accurate grinding control for highly polished inside surfaces is visually assured through gages that measure air pressure in the grinding head.

Flexibility makes profitable use of modern coated abrasives

With its automatic belt tensioning, water cooling, and easily adjusted speeds for belt, ram, and drive rolls, this flexible machine can use modern coated abrasives to greatest advantage for high-production tube grinding and polishing.

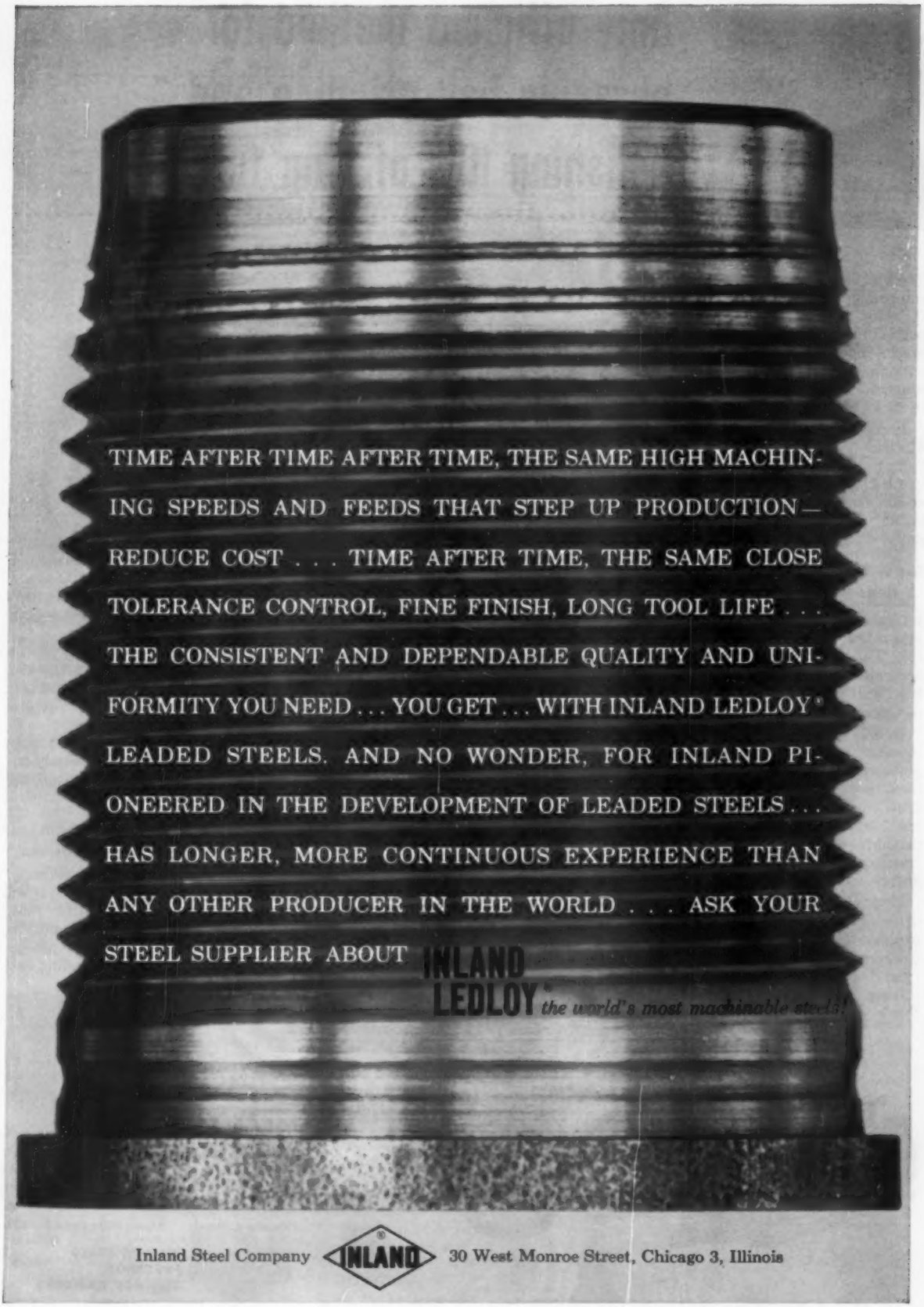
If deposit or scale build-up are limiting your product quality, send for the illustrated booklet describing the many applications of this internal tube grinding and polishing machine. Or ask your Mattison representative to show you how it can increase your tube grinding production.



MATTISON MACHINE WORKS
Rockford, Illinois Phone WOodland 2-5521

MATTISON MACHINE WORKS
HIGH-POWERED PRECISION SURFACE GRINDERS

CIRCLE 252 READER SERVICE CARD


TIME AFTER TIME AFTER TIME, THE SAME HIGH MACHINING SPEEDS AND FEEDS THAT STEP UP PRODUCTION—REDUCE COST . . . TIME AFTER TIME, THE SAME CLOSE TOLERANCE CONTROL, FINE FINISH, LONG TOOL LIFE . . . THE CONSISTENT AND DEPENDABLE QUALITY AND UNIFORMITY YOU NEED . . . YOU GET . . . WITH INLAND LEDLOY® LEADED STEELS. AND NO WONDER, FOR INLAND PIONEERED IN THE DEVELOPMENT OF LEADED STEELS . . . HAS LONGER, MORE CONTINUOUS EXPERIENCE THAN ANY OTHER PRODUCER IN THE WORLD . . . ASK YOUR STEEL SUPPLIER ABOUT INLAND LEDLOY® the world's most machinable steels!
Inland Steel Company
INLAND
30 West Monroe Street, Chicago 3, Illinois

FIELD REPORT...

Worcester Pressed Steel Sets Up Big Texas Stamping Plant

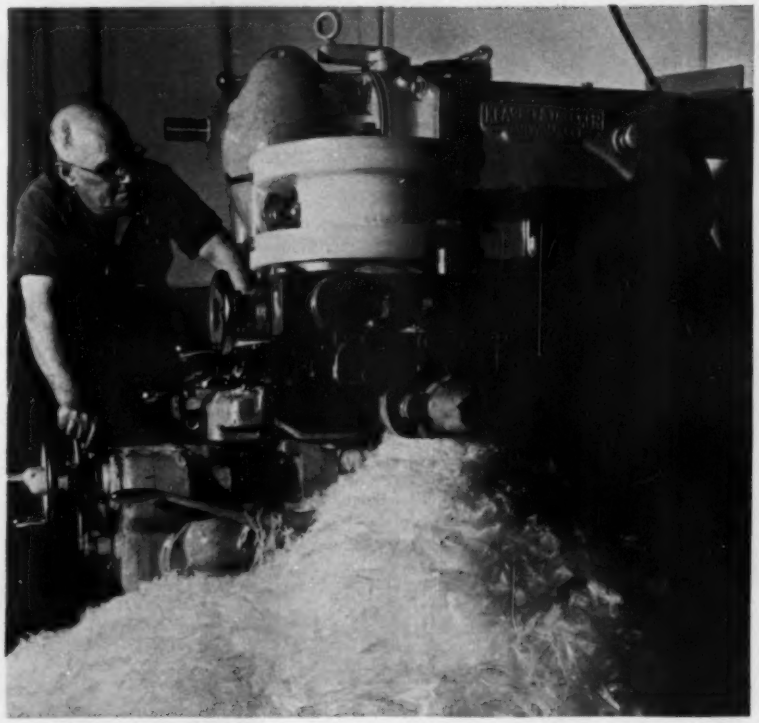
Westprest Inc, a large custom stamping plant, has been established in Amarillo, Texas, as a subsidiary of Worcester Pressed Steel Co, Worcester, Mass. It's been set up through acquisition of two adjoining metal fabrication plants—Speedy Mfg & Sales Corp, and Orna Metal Co. New company's extensive metal fabrication facilities are already being expanded with a quantity of additional stamping machinery. There will be 47,000 sq ft of floor area and, with new equipment now on order, the plant will be the largest custom stamping facility in the Southwest.

Roth Corp Takes Over Products Of White-Roth Machine

Roth Corp, New London, Ohio, has purchased all patents, drawings, inventory, tools, and equipment from White-Roth Machine Corp, Lorain, Ohio. The newly formed corporation will specialize in design fabrication of special equipment and machinery as well as contract machining. In addition, it'll manufacture and sell products formerly produced by White-Roth; these include phosphating machines, dry film coaters, sheet loaders, and stackers. Another product that'll be manufactured at the new facility is the Roth Coil Upender, a coiled strip steel handling device used in fabricating plants.

Vertol Now a Boeing Division

Vertol Aircraft Corp has become the Vertol Division of Boeing Airplane Co which has acquired all of the assets and obligations of the former company. Vertol's subsidiaries, Allied Research Associates Inc of Boston, and Canadian Vertol Aircraft Ltd of Arnprior, Ontario, will continue their present business relationships as Boeing subsidiaries.



Two polyethylene insulators 18½ inches in diameter were milled at Boeing's Aero-Space Division in Seattle for a unique electric switch used in discharging heavy current loads from large condenser banks. The insulators, capable of withstanding approximately 100 kilovolts, were machined by Boeing to insure design compatibility with the special two-million-amp switch designed by the University of California.

Brush Beryllium Expanding

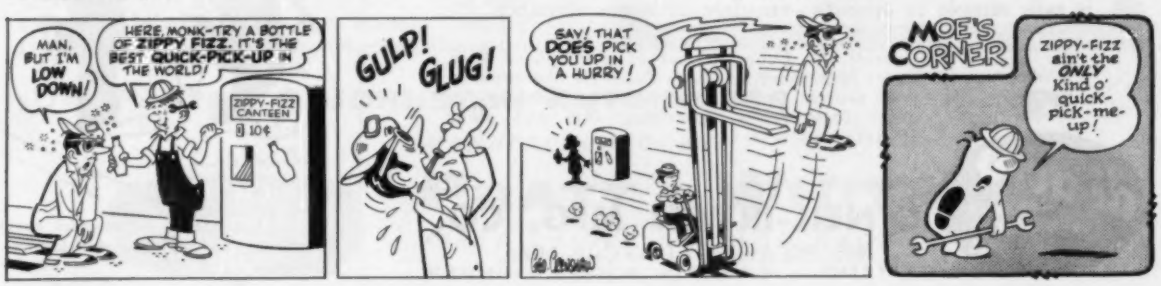
Brush Beryllium Co of Cleveland plans a substantial expansion of the capacity of its facilities. It'll increase capacity of its Elmore, Ohio, plant to produce vacuum-cast beryllium billets from 12,500 lb per month to 24,000 lb and will expand its beryllium hydroxide capacity from 35,000 lb of beryllium content per month to 60,000 lb. Additional beryllium metal output to be produced from the expanded facilities will be used by the company in its fabricating operations to meet the increasing demand for fabricated shapes. Company's sales in 1959 increased to $18 million from $12.6 million in 1958 and $7.9 million in 1957.

Century Electric Co . . .

. . . St Louis, Mo, has begun operations at its new Humboldt, Tenn, plant. Facility, part of the company's Hermetic Division, will manufacture general purpose electric motors and hermetically sealed units. Century will soon complete another Tennessee plant at McMinnville for production of small electric motors.

McGIRK'S WORKS

by GEO. CRENSHAW


MAN, BUT I'M LOW DOWN!
HERE, MONK—TRY A BOTTLE OF ZIPPY FIZZ. IT'S THE BEST QUICK-PICK-UP IN THE WORLD!
ZIPPY-FIZZ CANTEEN
10¢
GULP! GLUG!
SAY! THAT DOES PICK YOU UP IN A HURRY!
MOE'S CORNER
ZIPPY-FIZZ ain't the ONLY kind o' quick-pick-me-up!

Dial a hole in a jiffy with this new Di-Acro Turret Punch Press. Micrometer front operated back and side gauges provide instant gauging.

new Di-Acro turret punch press*

Accurate Burr-Free Punching at 12 Rotating Stations

The new Di-Acro 4 Ton Turret Punch Press provides rapid, close tolerance punching of round, square, oval and rectangular holes from 1/16″ to 2″.

Rotating turrets provide rapid indexing for single or sequence punching. Precision hole location quickly obtained with Micro-twin gauges. Punches sheet metals up to 16 gauge mild steel, fibreboard, asbestos, paper, cork, leather, rubber, plastic and other sheet materials.

Dies are mounted in turrets—always handy. Standard clearance between punch and die is .002″. Choice of 6 other clearances at no charge. The Di-Acro Turret Punch Press is safe, simple to operate—requires little maintenance.

Find Us Fast in The Yellow Pages

Consult the Yellow Pages of your phone book under Machinery, Machine Tools for the name of your nearest Di-Acro distributor or write us for quick facts folder describing this and other Di-Acro machines.

di-acro PRECISION METALWORKING MACHINES

*pronounced die-ack-ro

O'NEIL-IRWIN MFG. CO.

405 8th Avenue • Lake City, Minn.

Field Report . . .

Elgin to Build New Research And Engineering Plant

Elgin National Watch Co has announced plans to purchase an 8-acre site near Palatine, Illinois, for a new research and engineering plant for Elgin Micronics, a division of the company. The 15,000-sq-ft plant, ready for occupancy by fall, can be expanded to 60,000 sq ft to meet future requirements. A special, atmospherically controlled clean space will accommodate development work on precision products.

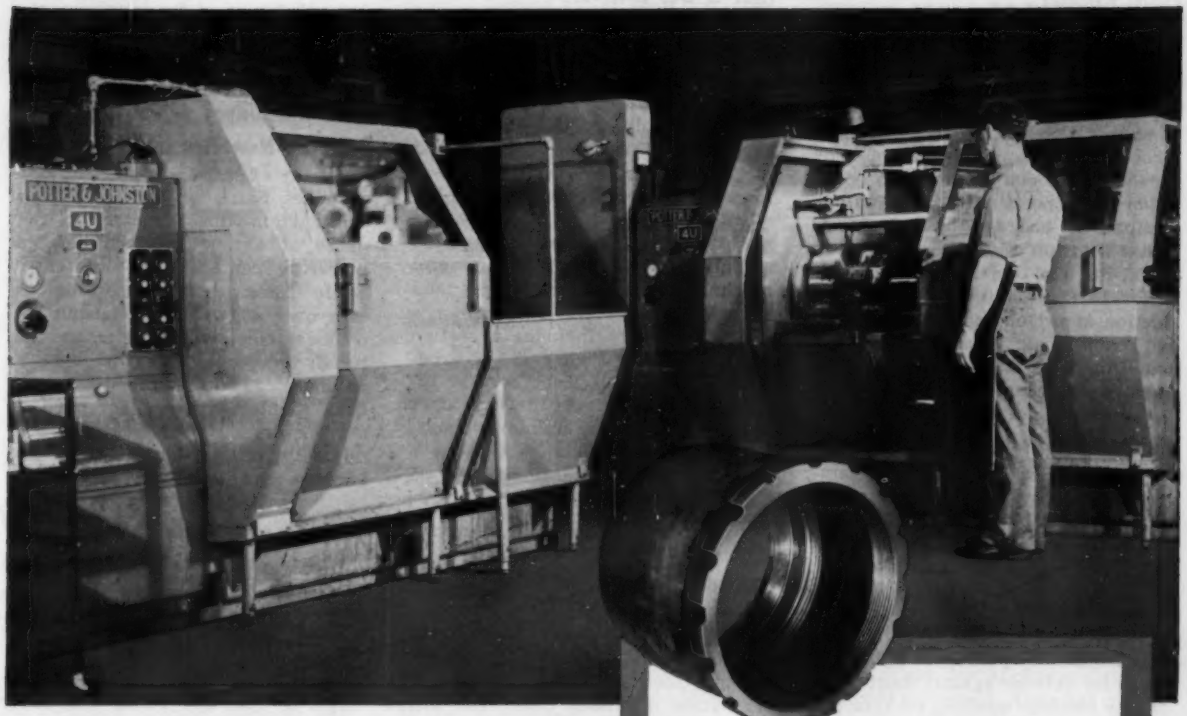
Pullman-Standard Selling Its Worcester Plant

Pullman-Standard announces that it is offering for sale its Worcester passenger car plant, which has been on a standby basis since December 1958. The plant covers 52 acres and has 600,000 sq ft of buildings. Company continues to operate passenger car production facilities in Chicago.

Budd Acquires Metrol

The Budd Co has acquired the assets of Metrol Inc, manufacturers of electromagnetic non - destructive testing equipment. Metrol will continue to operate in Pasadena as a department of Budd's Instruments Division.

"My boss says I have a persecution complex, but I know he only says that because he hates me."



"MACHINING TIME CUT 50-75%

...when we re-equipped with Potter & Johnston® Automatics!"

The world's oldest and largest producer of coal mining machinery, Joy Manufacturing Company, of Pittsburgh, Pennsylvania, was looking for a faster, more economical way to machine a variety of components. After a thorough investigation, which included time estimates for machining 12 different components, 2 Potter & Johnston 4-U Automatic Turret Lathes were selected over several competing makes. Among other factors, the P&J Machines were chosen, because their sturdier construction and greater power meant more metal removed faster, because their 6-face turrets and 2 cross slides provided greater multiple tooling capacity, and because fully automatic operation made it possible for 1 man to operate both machines. On-the-job results have amply justified Joy's decision. For example, machining the typical component shown here, previous time of 22.2 minutes has been reduced to 11.6 minutes using only one P&J Automatic and 5.9 minutes using both machines operated by one man!

Potter & Johnston Automatics helped this manufacturer save time and money—and they can do the same for you! Call the Pratt & Whitney Branch Office in your area and ask one of our Machine Tool Specialists to recommend a production plan for your specific needs. If you prefer, write direct, outlining your requirements. Pratt & Whitney Company, Inc., 11 Charter Oak Boulevard, West Hartford, Connecticut.

JOB FACTS:

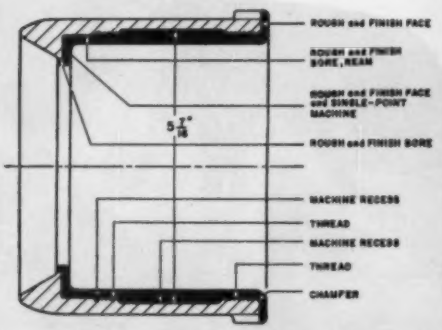
PART: Headlight Bell

MATERIAL: Malleable Iron Casting

REQUIRED: 11 roughing and finishing cuts: boring, reaming, facing, undercutting, grooving, tapping.

THE MACHINES: Two P&J 4-U Automatics operated by one man.

THE RESULTS: An accurately machined part completed every 5.9 minutes.



BLACK AREAS INDICATE METAL REMOVED

POTTER & JOHNSTON AUTOMATICS

MANUFACTURED BY

PRATT & WHITNEY®

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

100th Anniversary 1860 PW 1960

Field Report . . .

Conveyor Systems Acquires Oliver Corp Division

Conveyor Systems Inc, Morton Grove, Ill, manufacturer of engineered, specially designed conveyors and special material handling equipment, has acquired the Farquhar Division of the Oliver Corp of York, Pa. The division has been engaged in the manufacture and production of pre-engineered conveyors for commercial, industrial, and bulk handling fields and operates through dealers from coast to coast.

Mauler Missile Order to Convair

Convair Division of General Dynamics, Corp, Pomona, Calif, has a $5.5 million contract for development of a new highly mobile battlefield air defense missile system called Mauler. Mauler units, carrying solid-fuel, radar-guided missiles, will be carried by fixed-wing aircraft or helicopters and dropped by parachute into battle areas for defense against short-range enemy ballistic missiles, rockets, and tactical aircraft.

Tool & Die Institute Publishes Its Annual Directory

T&DI, representing manufacturers of special tooling in the Chicago area, has published the Thirty-Fifth Anniversary Edition of its 1960-61 Directory of members' specialized tooling facilities. The independent trade association is comprised of 500 members engaged in all phases of metalworking including tool and die and mold shops, engravers, general machine shops, manufacturers and their suppliers.

The Directory includes a section entitled "Thirty-Five Years of Progress in Chicago's Tool & Die Industry" which details the Institute's major activities and accomplishments during the past year as well as a resume of its background since its organization in 1925.

B F Goodrich Expanding Rocket Motor Plant

Expansion program that'll ultimately result in three times the present manufacturing capacity is under way at the Goodrich facility located on 160 acres in Rialto, Calif. The propulsion plant, operated by the Aviation Products Division, will have additional facilities for research and development as well as added production equipment.

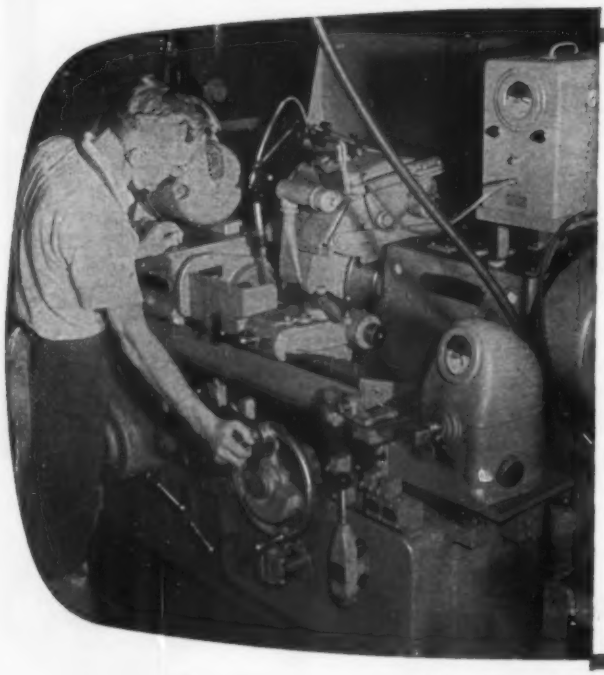
Food Machinery & Chemical Corp Building New Research Center

Company's Central Engineering Laboratories, San Jose, Calif, will start construction this summer on first phase of a new research and engineering center to be located in Santa Clara. Initial phase will contain over 40,000 sq ft housing mechanical, electronic, physics, and materials processing labs, as well as engineering and administrative offices. Center will be equipped to serve every stage of creative development from systems analysis and concept to prototype and test models.

Ferracute Machine Co . . .

. . . Bridgeton, NJ, builder of power presses, will have its line of presses, press brakes, and special machinery handled in Missouri and southern Illinois by Continental Machinery Sales Co, St Louis. Industrial Machine & Tool Co, Tulsa, will cover the state of Oklahoma.

ACCURACY ASSURED...



AIR-O-LIMIT* for Automatic Production Control

One of the nation's major home appliance manufacturers, Whirlpool Corporation relies heavily on Air-O-Limit Gages by Pratt & Whitney to combine speed, economy, and "tenths" precision in the production of vital compressor parts. Included are Air-O-Limit Automation Gaging Units that provide fully automatic control of product size. In the example shown here — an external grinder producing rotor shaft bearings — the grinding process is stopped automatically when work reaches the desired size. Scrap is practically eliminated, and bearings are dependably held to .0001" for size.

*REGISTERED TRADEMARK OF PRATT & WHITNEY COMPANY, INC.

100th Anniversary 1860 1960

FIRST CHOICE FOR ACCURACY

PRATT & WHITNEY

CIRCLE 256 READER SERVICE CARD

Field Report . . .

Chicago International Trade Fair

The 1960 Fair, sponsored by the Chicago Association of Commerce and Industry, will be held June 20-July 5 at Navy Pier Exhibition Hall. Newest imported machine equipment will be exhibited. Poland's Metalexport division, for instance, will show radial drilling machines, turret lathes, thread rolling machines, universal and vertical milling machines, hydraulic surface grinders, universal production lathes and shears, and automatic screw machines. Austria, Germany, and Japan are also expected to exhibit their newest products in the machine equipment field.

W S Rockwell Co . . .

. . . Fairfield, Conn, has established a Plastic Coating Division to provide a variety of thermoplastic finishes on surfaces of metal objects for corrosion resistance or decorative purposes. Complete facilities have been set up for preparatory sand blasting and cleaning of metal surfaces, preheating the objects, application of plastic coating by the fluid bed process, and subsequent heating or curing if necessary.

Laminated Shim Co . . .

. . . Glenbrook, Conn, has acquired the shim facilities of National Seal Division of Federal-Mogul-Bower Bearings Inc, Redwood City, Calif. All shim equipment is being moved to Connecticut and production of some items will begin immediately.

Mohawk Steel Co . . .

. . . will build a million-dollar steel fabricating and distributing plant on Hutchinson Island at Savannah, Ga.

Westinghouse to Supply Equipment For Russian Textile Mill

The Motor and Control Division of Westinghouse Electric Corp has a major portion of a $1 million contract to supply equipment for a Russian textile mill. The Buffalo plant will build more than 1500 motors ranging in size from 1 to 20 hp for the 50,000 spindle mill at Kalinin, 100 miles northwest of Moscow. When completed next year the facility will cost about $30 million. Included among the motors are adjustable voltage drive for the latest type of continuous bleaching and finishing ranges. Lint-free textile motors have been specified.

ASTME Adds Two

Approval of a charter for a chapter in Manila, Philippine Islands, and acceptance of an application for one in Mexico City will soon bring the total chapters of the American Society of Tool and Manufacturing Engineers to 166.

Temco Hawk Order

Temco Aircraft Corp has a $2.1 million contract for manufacture of components of the Hawk air-defense missile. Order will continue work already in progress at the company's Grand Prairie facility and will maintain employment at present levels.

Apex Machine Mfg Co . . .

. . . Richmond, Va, has been purpurchased by US Filter Corp which makes filters for approximately 50 brands of cigarettes. Apex has manufactured equipment for the tobacco industry since 1923.

with PRATT & WHITNEY GAGES

. . . and for Parts Inspection

At Whirlpool, in-process and final inspections are complicated by the close tolerances involved and the fact that most parts must be checked on several critical dimensions. These problems are effectively solved by specially engineered Air-O-Limit Multi-Station Comparators like the typical example shown here. In a single operation, this comparator checks 8 separate tolerances, which include 5 different characteristics: size, taper, out-of-roundness, squareness, and concentricity. Gaging is fast and accurate; inspection costs are kept to a minimum and gaging bottlenecks are eliminated.

For more complete information on Air-O-Limit Gaging for your production machines or inspection lines, write today describing your operations and quality control requirements. Pratt & Whitney Company, Inc., 11 Charter Oak Blvd., West Hartford, Connecticut.

"JOB ENGINEERED" MACHINE TOOLS • GAGES • CUTTING TOOLS

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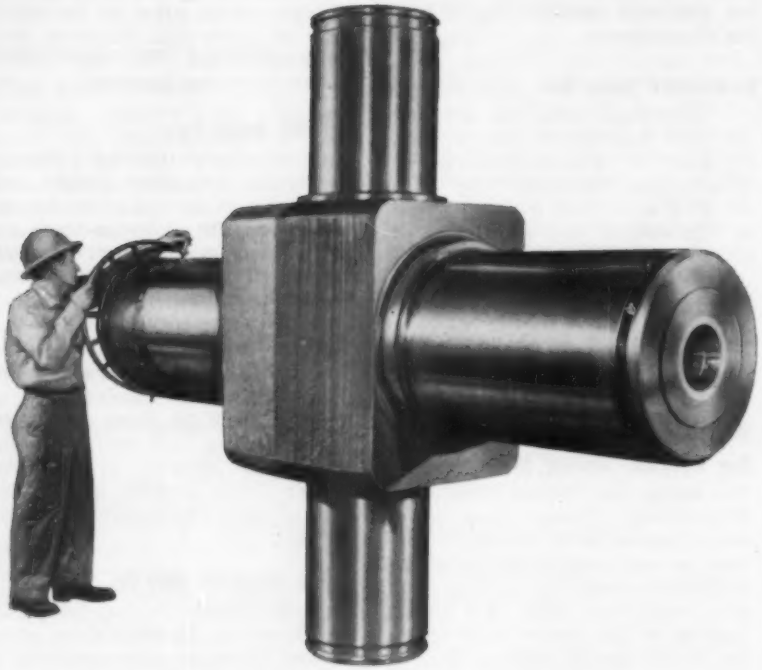

13½ TON EQUALIZING AXLE from BLUEPRINT to FINISHED PART by FINKL

This 27,000 pound steel forging,* made to support a million pound load, was completely manufactured from molten steel to a finished machined part in the Finkl shops.

A 115,000 pound electric furnace steel ingot was cast, forged, hot cut and heat treated, followed by hundreds of hours of rough and finished machining. Then the square section was heated to accept the horizontal part to complete the shrinking operation to make this equalizing axle.

Finkl is well-equipped to engineer and produce a wide range of forged parts . . . our sales engineers will be pleased to talk to you about your forgings, hot work steels and die block needs.

*Replaced a casting

HOT WORK STEELS · DIE BLOCKS · FORGINGS · ELECTRIC FURNACE STEELS

Manufacturers of the
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BOSTON • LOS ANGELES Warehouses in: CHICAGO • DETROIT • BOSTON • LOS ANGELES

Field Report . . .

Ryan to Build Rockets

Ryan Aeronautical Co, San Diego, has begun production of Viper rocket chambers for Grand Central Rocket Co of Redlands, Calif. First deliveries of the 105-in. long, 6½-in. wide assemblies will begin this month. The rockets propel high-speed (Mach 2) test sleds.

MEMOS

by BESS RITTER

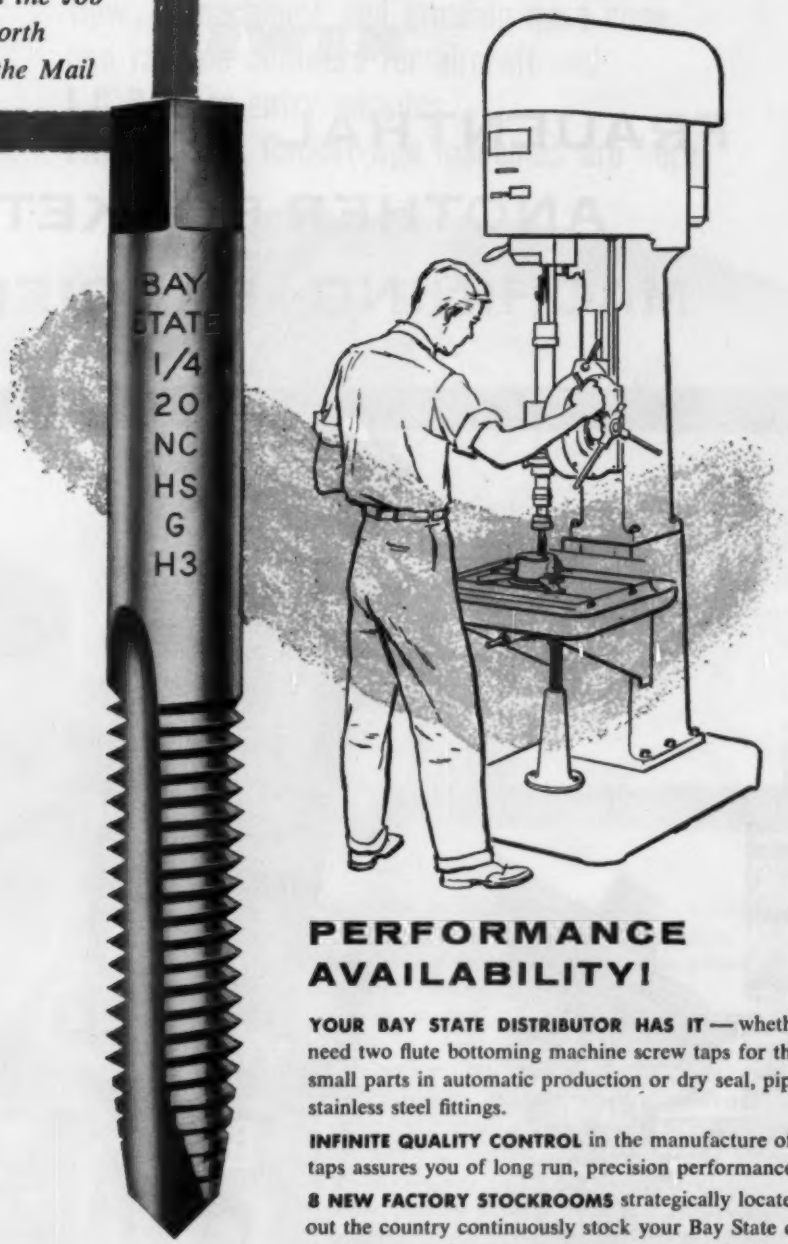
You've heard that Hiero, King of Syracuse, ordered a gold crown from a particular smith. When it was delivered, Hiero suspected that the crown was really alloyed with silver. He turned to the mathematician, Archimedes, to detect the fraud, if any.

This man couldn't figure out any answer, and at last, gave it up and took a bath. However, his mind still played on the problem, and he was so bemused with it that he accidentally allowed the tub to overflow. Then he reasoned: If a gold crown is put in a full tub of water, and the overflow is weighed, it can be determined whether the crown is really gold if a piece of gold which weighs as much as the crown is put in another tub of water. All you have to do is weigh this overflow, and compare it with the overflow in the tub which held the crown!

He was so delighted with his reasoning that he ran naked through the streets of Syracuse and shouted what became the famous word, "Eureka!"

But did you know that the test was used and proved that the smith had tried to cheat the king. And that over two thousand years after Archimedes died the incident was still considered to be worthy of commemoration, for "Eureka!" is the motto of the state of California, in honor of the gold that was found here.

A Tap on the Job
is Worth
Two in the Mail



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YOUR BAY STATE DISTRIBUTOR HAS IT — whether you need two flute bottoming machine screw taps for threading small parts in automatic production or dry seal, pipe taps for stainless steel fittings.

INFINITE QUALITY CONTROL in the manufacture of Bay State taps assures you of long run, precision performance.

8 NEW FACTORY STOCKROOMS strategically located throughout the country continuously stock your Bay State distributor to meet every tapping requirement. And — Bay State's factory trained tapping specialists work closely with distributors to assure the most efficient tapping performance for their customers.

Call your Bay State distributor and . . . YOU WON'T GET CAUGHT WITH YOUR MACHINES DOWN.

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BAY STATE TAPS

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A SUBSIDIARY OF THE CLEVELAND TWIST DRILL COMPANY

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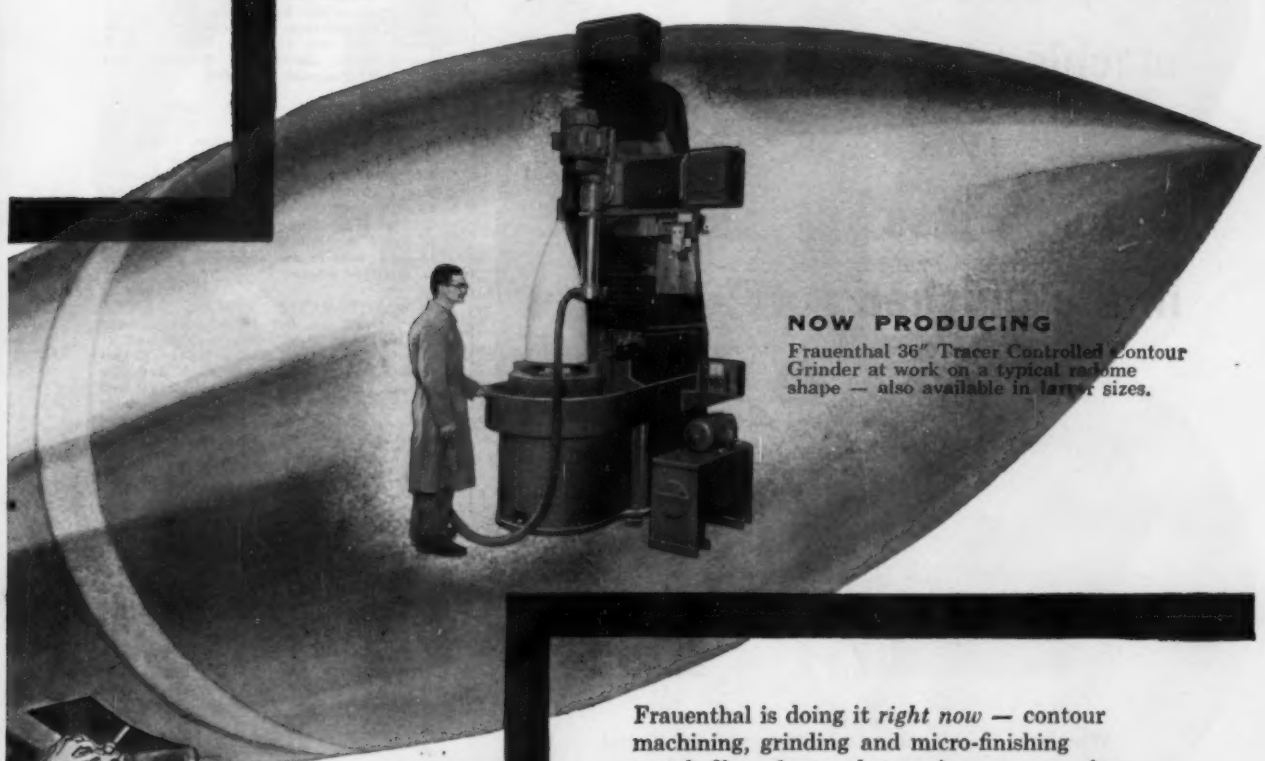
NEWS!

FRAUENTHAL BREAKS ANOTHER ROCKET-AGE MACHINING BARRIER

NOW PRODUCING

Frauenthal 60" dia. Contour Finishing Machine with 15' length capacity designed and built for Walter Kidde & Co., Inc.

Now... machining and grinding nose cone and radome contours for aircraft and I. C. B. M. re-entry missiles . . . FRAUENTHAL Rocket-Age machines are here!



NOW PRODUCING

Frauenthal 36" Tracer Controlled Contour Grinder at work on a typical radome shape — also available in larger sizes.

NOW PRODUCING

Frauenthal Precision Contour Turning and Finishing Machine. Producing to accuracy of ± .0005 over entire 60" diameter contoured surface, with 4 RMS maximum finish on re-entry nose cone.

Developed for AVCO Research and Advanced Development Division on the Titan program.

Frauenthal is doing it *right now* — contour machining, grinding and micro-finishing metal, fiber glass and ceramic nose cones for America's Space-Age missiles.

These creatively designed machines can generate nozzle throat contours for rocket motors, lay up or wind resinoid bonded material on formed mandrels, contour turn and grind mandrels or other difficult-to-work shapes and materials.

Contact Frauenthal now for forward-thinking machine designs. You'll get advanced engineering that *anticipates* your current and future requirements. All to help you profitably BREAK THROUGH in your field of operations.

FRAUENTHAL

DIVISION

THE KAYDON ENGINEERING CORP.

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4140 and 4150 type Free-Machining Alloy Steels machine better than regular types . . . and cost less in the finished part!

Wheelock, Lovejoy is your best source of 4140 and 4150 type free-machining alloy steels, the easy-working steels that machine far better than regular type steels, and which cost *less* in the finished part.

Wheelock, Lovejoy, for many years the pioneer in the development and application of 4140 and 4150 type free-machining alloy steels, offers you the most extensive stocks anywhere, in all W-L warehouses.

Available variety of 4140/50 type free-machining stock includes round, square, flat, billets, and forgings to specifications.

For best stocks, best service, get in touch with your nearest Wheelock, Lovejoy warehouse.

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STEEL SERVICE CENTER INSTITUTE

Free Literature

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MACHINES AND ATTACHMENTS

1 TOOLMASTER MILLING MACHINES—*Cincinnati Milling Machine Co, Cincinnati 9, Ohio.* 24-page catalog M-2110 illustrates and describes features of units available in four different styles which differ mainly in spindle carrier design; all other machine extras are identical. All have 22-in. longitudinal table traverse; three models have 8 spindle speeds, one has infinitely variable. Full specifications, dimensional drawing, and functional diagrams included.

2 ANNULAR FORM GRINDER—*Sheffield Corp, Dayton 1, Ohio.* 10-page catalog FG-181-260 gives details on Model 181 Multiform machine for grinding annular forms and grooves in workpieces up to 10 in. diameter and 24 in. between centers. Machine utilizes the Crushtrue grinding wheel dressing process to grind multiple diameters or forms up to 4 in. wide in one operation with single or multiple wheels.

3 AUTOMATIC POWER SAWS—*DoAll Co, Des Plaines, Ill.* 12-page catalog, form 59-39 3-60, describes and illustrates new line that consists of two models for straight cutoff work and two models for mitering and angular as well as straight cutoff. Speedmaster variable drive makes it possible to change tool speed instantly within a velocity range of 60 to 350 fpm.

4 MULTIPLE TAPPING AND DRILLING HEADS—*Ettco Tool & Machine Co, 594 Johnson Ave, Brooklyn 37, NY.* 6-page bulletin 600C provides information on Knuckle-head universal ball joint adjustable spindle heads available in five models to convert any drillpress into a a high production multiple drilling and tapping machine. Line includes circle types with 4, 6, or 8 spindles as well as the 6 and 11-spindle straight line models. Also gives data on other interchangeable components that make up the heads.

5 PROXIMITY SWITCH PRESS CONTROL—*Robotron Corp, 21300 W Eight Mile Rd, Detroit 19, Mich.* 4-page bulletin describes Model 27B26D-A die saver switch control system that can be

"He's on vacation and there's nothing he likes better than to loaf on the job."

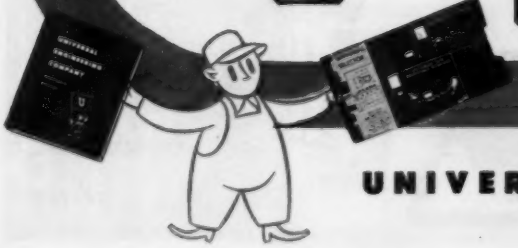
you get close tolerance drilling with
UNIVERSAL DRILL BUSHINGS

Accurately machined bushings are essential when drilling to close tolerance. UNIVERSAL DRILL BUSHINGS, of finest quality steel, are carefully tested for 100% concentricity and hardness, assuring pin-point accuracy and uniform quality. To prevent tool hang-up and breakage, each bushing has a blended radius on the top inside diameter.

All bores are superfinished. This superfinishing of bushings is important, especially in close tolerance work, because it reduces both tool and bushing wear to a minimum. Knurled head gives a quick, sure grip.

We stock drill bushings in all standard sizes and lengths at each of the following offices—Universal Engineering Sales Co., 1060 Broad St., Newark 2, New Jersey; 5035 Sixth Ave., Kenosha, Wis., and at our home office in Frankenmuth. Contact the nearest office for immediate delivery.

The Universal Drill Bushing Slide Chart gives accurate engineering data for the selection of all types and sizes of drill jig bushings up to 1¾" drill size. You may have one—free—by requesting on your company letterhead. At the same time, get your copy of our new catalog that describes all of UNIVERSAL'S products including chucks, tool holders, boring bars, bushings and index plungers.



UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 1, MICHIGAN

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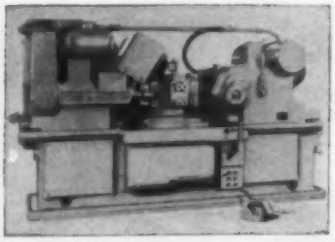
Here's what is meant by

"1·2·3"

in the

GOSS & DE LEEUW AUTOMATIC CHUCKING MACHINING



The outstanding advantage of this machine is ability to handle operations on one, two or three ends of a piece *simultaneously or in sequence, without changing set-up or reheadling.* It is the only standard machine that will do this.

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence—a method exclusive with Goss & DeLeeuw and offered on this machine.

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adapted to any press operation, manual or automatic. System automatically stops the press instantly in event of any malfunction, misfeed, or failure to strip or eject.

TOOLS AND ACCESSORIES

6 MOTORIZED HARDNESS TESTERS—*Torsion Balance Co, Clifton, NJ.* 4-page bulletin CRS-60 describes and pictures the Kentrall line of four models. They are available in combination testers which provide both regular and superficial Rockwell hardness testing in a single machine. For those applications that do not require the additional range these motorized testers are also available as single-purpose instruments for either regular or superficial testing alone.

7 AIR TOOLS—*Master Power Corp, Box 269, Krick Rd, Bedford, Ohio.* 10-page illustrated catalog G-60 provides information on complete line of grinders, sanders, and wire brushing tools. Specifications included as well as section on recommendations for achieving maximum output.

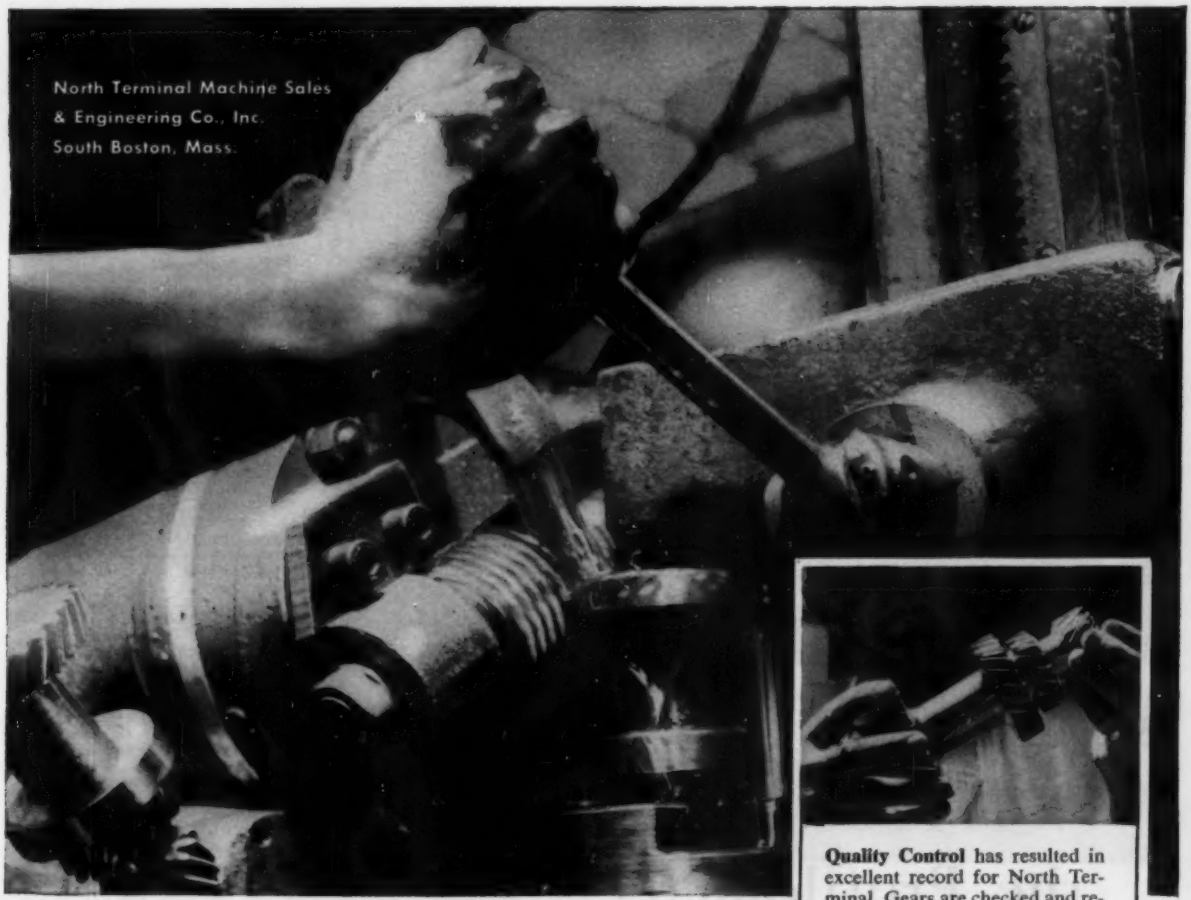
8 PRECISION TOOLS—*L S Starrett Co, Athol, Mass.* 30-page bulletin 143 illustrates, describes, and gives specifications for complete line of products including dial indicators; micrometer calipers; gages; micrometer heads; protractors; master vernier calipers; mechanics' tool chests; rules; tapes; blades.

9 SENSING DEVICES — *Consolidated Electrodynamics Corp, 360 Sierra Madre Villa, Pasadena, Calif.* 16-page general catalog 1308 gives design details and applications of pressure instrumentation; force-balance instruments; unbonded strain-gage and potentiometer pressure transducers; vibration transducers; accelerometers; galvanometers; and ceramic and precision optical products.

10 CONVERSION CHART—*Babcock & Wilcox Co, Beaver Falls, Pa.* Technical Data Card 183 shows in chart form the approximate relation between hardness by various testing systems and tensile strength of carbon and alloy steels. Hardness systems covered are Brinell, Monotron, Vickers, and Rockwell (B, C, and E scales) and Scleroscope.

11 SMALL TOOLS—*Durant Tool Co, 15 Thurbers Ave, Providence, RI.* 4-page bulletin illustrates and gives brief descrip-

"That old machine has had it!"



Quality Control has resulted in excellent record for North Terminal. Gears are checked and rechecked after each step in production. Quality lubricants have helped hold to close tolerances.

Hob Life Increased 250% with Cities Service Chillo 10 Cutting Oil

North Terminal makes replacement gears for automobile transmissions. In a day's time the firm—which makes the gears from raw stock to finished product—completes up to 5600 gears. Producing in quantities like this, hob life is an important consideration in *cost* of production as well as *quality* of production.

Previous cutting oils were tested on the gear hobbing machines and they resulted in hobs producing as low as 87 gears before replacement. Cities Service Chillo 10 cutting oil under the same conditions resulted in over 200 gears with a superior finish before a hob replacement was necessary.

5600 Gears per day or the equivalent of 800 replaced transmissions are produced every day by North Terminal. Gears are made for all makes of cars with a good portion of production being shipped overseas.

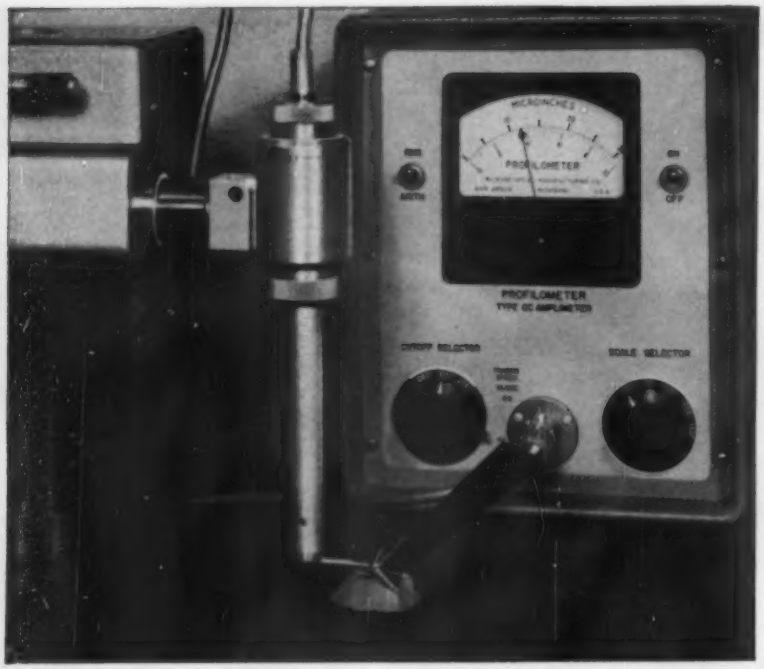
Edward W. Malley Jr., President of North Terminal, states, "We didn't choose Cities Service cutting oil blindly. Many competitive oils were tested before we were satisfied that Chillo 10 was superior in every way."

Even if you're satisfied with your present cutting oil, a test of Cities Service Chillo 10 may give you a very pleasant surprise. Test after test under actual manufacturing conditions has shown Chillo 10 to give longer tool life and superior finishes.

Arrange for your own test by calling your nearest Cities Service office or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, New York.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



PERTINENT QUESTION:

WHY do you need the Profilometer®?

FACTUAL ANSWER:

To check practically *all* surfaces against microinch roughness specs —and to help cut production costs in 7 different ways.

FREE BULLETIN LT14 gives details on the Profilometer and its practical applications. May we send you a copy?

MICROMETRICAL MM® MANUFACTURING COMPANY
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Manufacturer of the PROFILOMETER®, PROFICORDER®, MICROCORDER®, WAVOMETER®, ANDEROMETER®, VAROMETER®, CHART VIEWER • Exclusive American Sales Agent for CENSOR Dimensional Gaging and Sorting Equipment

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

tion including sizes, specifications, uses, and prices of dieset pullers, toolmaker's and diemaker's vise, toolmaker's clamps, punch holders, drill vise, and collet holding fixture.

12 CERAMIC TOOLING MATERIALS —*Duramic Products Inc, 456 Commercial Ave, Palisades Park, NJ.* Bulletin 120 is the first in a series of high temperature applications bulletins offering detailed information on use of ceramic tooling materials at elevated temperatures. Shows typical application of a Duramic 2000 F material in an RF soldering application. Photo shows a fixture arrangement for soldering a magnet assembly giving details on RF coil design, fastening, and locating methods used.

13 PRECISION HAND TOOLS—*Handicraft Tools Inc, Division of X-acto Inc, 48-41 Van Dam St, Long Island City 1, NY.* 12-page illustrated catalog covers tools for small parts handling and subassembly operations. Includes tools for cutting, trimming, slicing, deburring, etching, and parts holding.

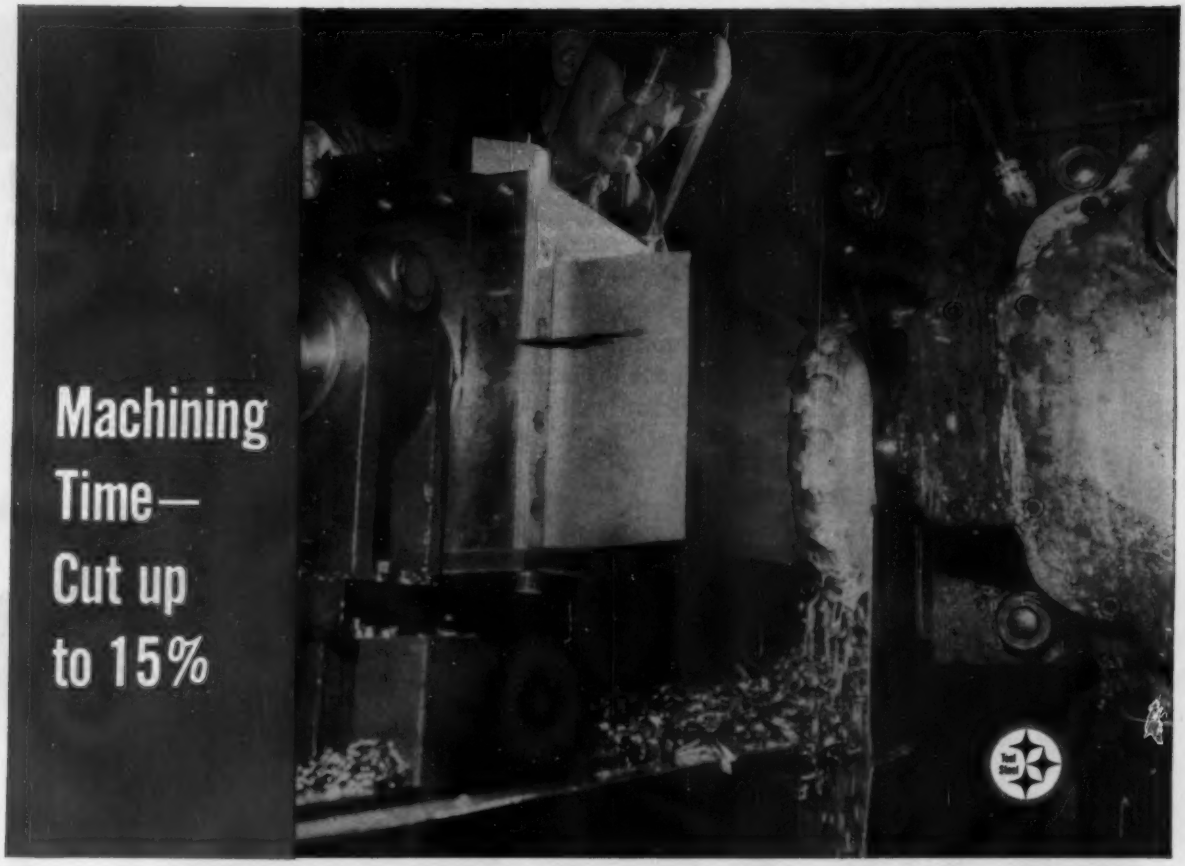
14 TORQUE TENSION TESTING EQUIPMENT — *Skidmore-Wilhelm Manufacturing Co, 442 S Green Rd, Cleveland 21, Ohio.* Illustrated bulletin 214 describes line of portable equipment and discusses various applications for these precision instruments — hydraulic devices designed to eliminate bolt failures resulting from improper initial tightening. Model line will test bolts from No. 10 to 2½ in. dia and measure bolt load capacities up to 225,000 lb.

15 DIAMOND GRINDING WHEELS—*Simonds Abrasive Co, Tacony & Fraley Sts, Philadelphia 37, Pa.* 4-page illustrated bulletin ESA-310 describes wheels featuring both man-made and natural diamonds. Grain and grade recommendations, operating data, and pictures of all standard shapes included.

16 CUTTING TOOLS—*Rico Tool Co, 5915 Dixie Highway, Saginaw, Mich.* Catalog contains information on complete line of rotary carbide and HSS cutting tools plus data on new line of burrs and countersink sets.

(continued on page 180)

"Now, there may be some of you dissatisfied with present company policy!"



Dependable DESEGATIZED® FM Die Steels

. . . easier to work . . . easier to machine

•

In the production of thousands of metalworking dies, the properly dispersed alloy sulphides in Latrobe's FM High Alloy Die Steels have permitted increased feeds and speeds—*machining time cut up to 15% in most cases!* This cost-saving production is possible with no sacrifice of the excellent toughness, wear resistance and hardenability properties of the steel.

FM die steels are produced by Latrobe's Desegatized process of manufacture. This process guarantees full structural uniformity of the steel—an even distribution of the all-important carbide particles and "free-machining" alloy sulphides—your assurance of dependable quality.

Four grades of 12% chromium FM steels are regularly stocked: Olympic FM (type D-2) for long-run applications; BR-4 FM (type D-7) for extreme abrasion resistance; GSN FM (type D-3) for severe non-deforming requirements; Cobalt Chrome FM (type D-5) for extra resistance to galling and pickup.

For better die steels and technical service, call your nearest Latrobe representative. Literature on grades available upon request.

Skillfully made in U.S.A. by . . .

Metalmasters

LATROBE STEEL COMPANY
LATROBE, PENNSYLVANIA

BRANCH OFFICES and STEEL SERVICE CENTERS: BOSTON • BUFFALO • CHICAGO CLEVELAND • DAYTON • DETROIT • HARTFORD • LOS ANGELES • MIAMI • MILWAUKEE NEW YORK • PHILADELPHIA PITTSBURGH • SAN LEANDRO • TOLEDO

Throw those old-fashioned collets away!

Now you can afford to equip your

Atlas SHELDON **DELTA** SOUTH BEND *Logan*

lathes with the world's most modern collet chuck and its Rubber-Flex® Collets

$70.00
Model 50
Collet Chuck

$65.00
Complete Set of
10 Rubber-Flex Collets

You get a lot more for less!

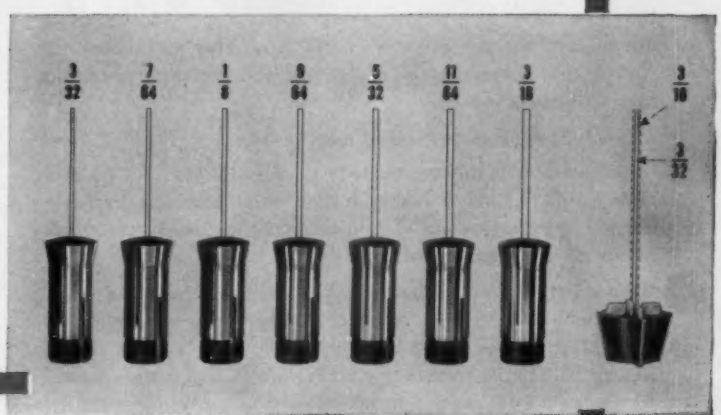
model 50

- is a brand new nose type handwheel chuck
- is quicker to operate
- is easier to operate
- is more accurate
- develops more torque
- increases lathe capacity
- mounts directly onto your spindle
- costs less . . . less . . . less . . .

A lot more for a lot less...

$70.00
for the chuck!

$65.00
for the collets!
($6.50 each)



An entirely new series of ten Jacobs Rubber-Flex Collets has been developed along with the world's most modern collet chuck. Rubber-Flex collets do more because:

- **Jaws are always parallel for greater accuracy . . . maximum runout .001".**
- **Extra long bearing surfaces have stronger grip.**
- **Only 10 collets chuck all bar sizes—3/32" to 1 1/16"—.100" range per collet.**

How one Rubber-Flex collet replaces seven split steel collets

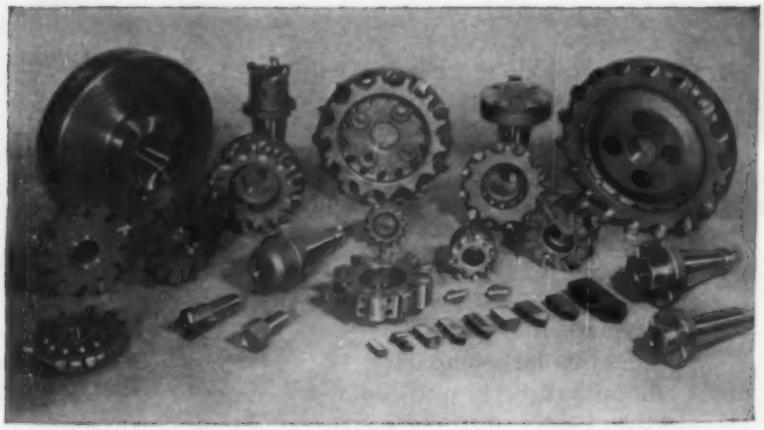
This is the chuck,
these are the collets,
for your . . .

ATLAS • DELTA • LOGAN
SHELDON • SOUTH BEND
. . . lathes

See your Jacobs industrial supply distributor. Let him prove these fantastic facts with a convincing demonstration at your desk! Call him today.

Jacobs CHUCKS

JACOBS MANUFACTURING COMPANY • WEST HARTFORD, CONNECTICUT



Milling Cutters — End Mills — Blades — Boring Tools — Arbors — Flywheels

These Lovejoy Products can help you Cut Costs!

The entire line of Lovejoy Milling Cutters and Accessories is designed to aid you in getting better production at less cost.

If you are not now using Lovejoy products, we invite you to do so at first opportunity.

Lovejoy precision-engineered tools include:

Inserted-tooth milling cutters (face, side, end, slotting and boring) which feature husky, forged steel housings; exclusive Lovejoy "positive-locking" blade assembly; a variety of dozens of models and hundreds of sizes.

Blades: H.S.S., Vasco Supreme and carbide. These are interchangeable over a wide range of housing sizes, and Type "A" face milling blades will fit any standard Lovejoy Type "A" cutter of 4½" to 24" dia. All Lovejoy blades are carried in stock, ready for immediate shipment. Special cutters are a Lovejoy specialty.

NEW "JOYDEX"

This performance-proved face mill features indexable blades for low cost-per-edge cutting. Exclusive design improvements include — adjustable anvils • extra deep chip flutes • fast, easy indexing • sweep blades for fine finish • double positive, or combination positive and negative rake angles merely by changing blades • rugged, one-piece body • large locking screws. *Try out a new "Joydex" and prove its superiority! ("Joydex" data sheet is yours for the asking).*

Catalogs — include: "Face Mill Catalog No. 31; Side Mill Catalog No. 32; Type "S" Bulletin; Arbor Catalog No. 33; "Speed and Feed" Calculator. Write today for copies desired.

LOVEJOY TOOL COMPANY, INC.
Springfield, Vermont, U.S.A.

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

17 STANDARD CARBIDE CUTTING TOOLS—*Dixie Tool Industries, 4555 W Franklin Ave, Bridgeport, Mich.* 24-page illustrated catalog 114 covers complete line (with specifications) including end mills; die-sinking, routing, and keyway cutters; drills; burrs; and file sets, plus data on a new solid carbide bore reamer.

18 ALUMINUM THICKNESS CHECKER—*J-R Engineering Co, Wausau, Wis.* Illustrated catalog sheet gives information on the Anotron, a portable electronic instrument for checking the thickness of anodized aluminum surfaces.

19 MILLING CUTTERS—*O K Tool Co, Milford, NH.* 8-page illustrated brochure covers milling cutters, single and multi-point tools, and accessories such as drive collars, special arbors, micrometric spacers, and the Wickman carbide impregnator.

20 JAW CLAMPS—*J & S Tool Co, 87 Dorsa Ave, Livingston, NJ.* Literature contains information on all-purpose jaw clamps that eliminate use of U-clamps, straps, and fingers. Includes specifications, illustrations, and diagrams of the clamps which are easily adapted to box fixtures.

HEAT TREATING AND WELDING

21 FURNACES FOR STAINLESS STEEL—*Drever Co, Bethayres, Pa.* 16-page bulletin B-81 discusses use of furnaces and equipment for heat treating stainless steel as strip, sheet, tube, wire, bar, and formed and machined products. Pictures and describes types used in each operation and covers latest developments in continuous, semi-automatic, and batch methods.

22 TRANSFORMERS FOR RESISTANCE WELDING—*Taylor Winfield Corp, Warren, Ohio.* 20-page technical brochure SP-23 contains data including construction techniques, transformer rating and load demand, magnetizing and load transients, application, and duty cycle. Formulas are provided for calculating kva loading at various duty cycles with consideration of series parallel windings, eight step windings, etc. Schematic diagrams, drawings, charts, and graphs included.

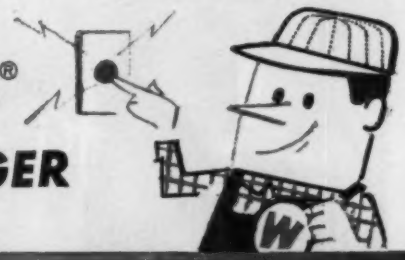
23 WELDING POWER SUPPLIES — *Glenn Pacific Power Supply Corp, 703 37th Ave, Oakland 1, Calif.* 4-page brochure includes features, applications, and

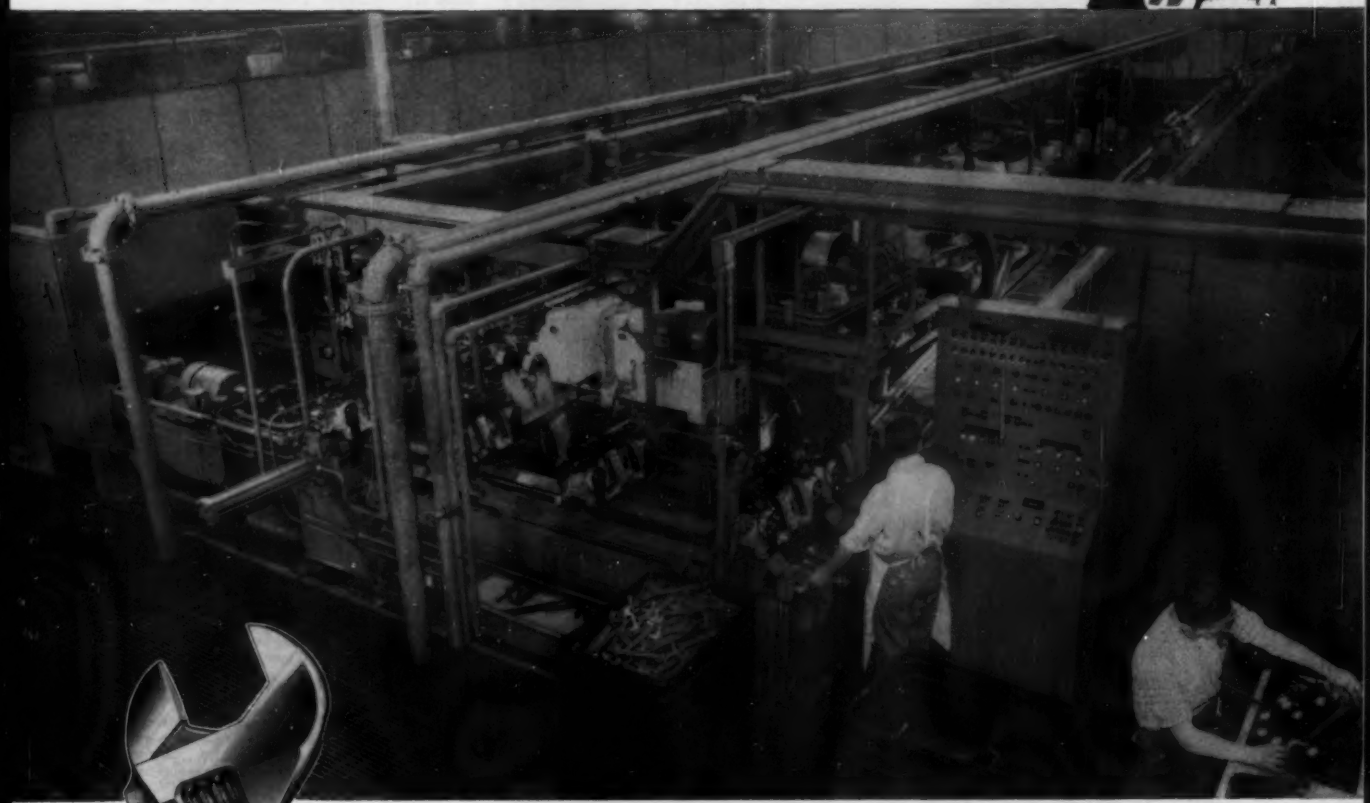
"I guess it's not a minute-car-wash!"

It's a Push-Button World at WILLIAMS

that's why SUPERJUSTABLES®

WORK BETTER • LAST LONGER





• AUTOMATED MACHINING guarantees smooth adjustment, exact fit in every wrench. This million dollar transfer machine was designed especially for Williams' Superjustable® wrench production. A push of a button puts 28 stations in operation... consistently machining to uniformly close tolerances. Fully machined wrench heads are constantly checked on special gauges to further insure perfect fit with sliding jaws, worms, pins and springs. No other manufacturer has this automated equipment to so precisely machine wrenches that *work better... last longer.*

Send for New Catalog No. 304. Lists over 4530 Stock Wrenches, Tools and Forgings... the Broadest Line of its kind.

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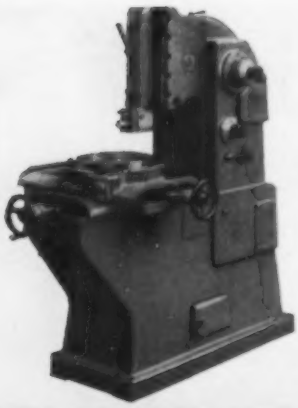
TOOLS of INDUSTRY

Superjustables® are available in regular or locking styles in sizes ranging from 4 to 24 inches, Black or Chrome finish.



SPEED AND FLEXIBILITY

— with cost-cutting Vertical Shapers

Easily set up and using the simplest tooling, the CHOMIENNE M-5" with its combination of longitudinal, transverse and rotary table movements, angular ram adjustment and ram speeds up to 270 strokes per min. solves production "problems."

Also available —
Vertical Shaper, 12" with 28¾" Rotary Table, 5 HP motor.
Horizontal Shapers, plain and universal 12" to 30" stroke, 2 to 10 HP motors

5" Vertical Shaper
12½" Rotary Table
2 HP motor

austin industrial corporation

76-F Mamaroneck Avenue White Plains, New York

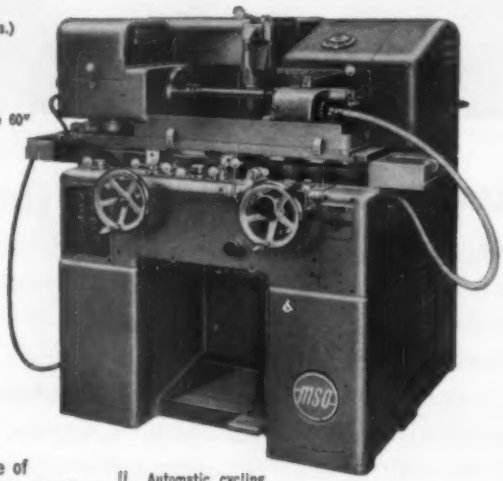
CIRCLE 277 READER SERVICE CARD

MSO Since 1865

FOR MORE PROFITABLE GRINDING

For automatic production in plunge or traverse grinding MSO Hydraulic Grinders offer ease and speed of operation with single lever control, automatic cycling including variable spark-out to fine finish and preset size — against positive stop (repeat accuracy .00004") or by electric gauge.

Model FH-200 (Illus.)
Swing 10"
Model FH-150
Swing 7"
Model FH-300
Swing 13¾"
Grinding lengths to 60"



MSO offers a complete line of precision grinding machines with features such as:

Automatic cycling
+ Precimatic sizing
+ Electronic Match Grinding

WRITE FOR LITERATURE ASK FOR REFERENCES

When only the best will do, check MSO first

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Free Literature

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specifications of constant voltage power supplies with slope control for precision welding of space-age materials. Supplies described include those for such processes as Heliarc (TIG) Sigma (MIG) including short arc Unionmelt (submerged arc), and Unionare (magnetic flux).

24 WELDING FILLER RODS — *National Cylinder Gas Division, Chemetron Corp, 840 N Michigan Ave, Chicago 11, Ill.* New data sheets for 12 NCG welding filler rods include specifications, welding and brazing characteristics, physical properties, and a color identification guide. Procedures for welding and brazing as well as typical applications are given.

25 AIR-COOLED ELECTRODE HOLDER—*J B Nottingham & Co, 441 Lexington Ave, New York 17, NY.* Data sheet pictures and describes holder for heavy-duty metallic arc welding. Simplified cooling, with air at low pressure flowing from perforations in the handle, is described; ratings and specifications are given, and design and construction features summarized.

26 BRAZING TORCH — *Prest-O-Matic Co, PO Box 531, Costa Mesa, Calif.* 4-page illustrated bulletin contains description of the Prest-O-Matic, a battery-ignited automatic air-acetylene brazing torch with built-in self-lighting electro ignition system. Flame is provided with temperature of approximately 4000 F at torch tip.

PLANT SERVICE EQUIPMENT

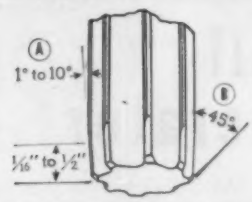
27 PLATING SOLUTIONS ANALYSIS—*Hanson-Van Winkle-Munning Co, Matawan, NJ.* 36-page booklet describes simple analytical methods for plating solutions; procedures outlined can be easily carried out by non-technical personnel. Prefaced by a discussion of analytical principles, use of apparatus, and methods for sampling a solution, booklet outlines step-by-step procedures in a number of analytical methods for testing nickel, copper, silver, and other metal-fin-

"You about ready to break the kid in on this machine, Murray?"

CLIP AND FILE

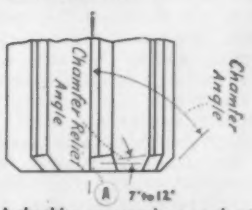
REAMING TIPS YOU CAN USE

SECONDARY CHAMFER



Grinding a secondary chamfer angle as illustrated (A) is often recommended. It is useful in applications where a fine finish or close tolerance is required. (B) is the regular chamfer.

KEEP IT SHARP



A chucking reamer is an end cutting tool. The cutting edges are produced by the chamfers at the ends of the lands. (A) To obtain maximum performance, the chamfers and clearance relief should be reground before excessive wear develops. Each chamfer should be ground exactly even or the tool may cut oversize.

OVERCOMING CHATTER

To end chatter in reaming, try Chicago-Latrobe's Duo-Spiral Reamer. The alternate left and right hand helixes tend to dampen cutting vibration; eliminate hogging; produce more accurate, better finished holes.

GOT A PROBLEM?

Arrange a consultation with a Chicago-Latrobe Sales or Service Engineer. His experience in hundreds of plants can lead to a quick solution of your problem.

Best tip of all...

ASK YOUR DISTRIBUTOR FOR . . .

Chicago-Latrobe REAMERS

DRILLS • REAMERS • END MILLS
COUNTERSINKS • COUNTERBORES
CARBIDE TOOLS • SPECIAL TOOLS and
"LO-TORK" CHIP BREAKER DRILLS

Write Chicago-Latrobe or call your distributor for CATALOG No. 59. Sixty-eight pages of illustrated listings and specifications—including prices.

CHICAGO-LATROBE
415 West Ontario Street Chicago 10, Illinois

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lishing solutions. Conversion tables are included and analytical reagents are listed for all types of plating solutions.

28 PACKAGED MULTI-ZONE AIR CONDITIONERS — *American - Standard Industrial Division, Detroit 32, Mich.* 4-page illustrated bulletin 8625 describes new line, picturing both the single-zone basic unit and the multi-zone design. Line drawings illustrate available arrangements and location of basic elements. Specifications and dimensions tabulated.

29 METAL FINISHING PRODUCTS—*Conversion Chemical Corp, 93 E Main St, Rockville, Conn.* Reference chart for metal finishers lists 50 Kenvert items including chromate treatments, bright dips, brighteners, plating additives, pickling and cleaning specialties, and protectives, all designed for specific applications.

30 DUST COLLECTORS — *Hammond Machinery Builders Inc, 1618 Douglas Ave, Kalamazoo, Mich.* 16-page catalog DK-820 discusses methods for solving dust, dirt, and mist collecting problems. Describes various models in the line of DusKolectors, provides general application information. Installation recommendations, photos, features, dimensions, given for each of the units; accessories and extra equipment covered.

31 TRUCKS: STANDARDS VS SPECIALS — *Automatic Transportation Co, 149 W 87th St, Chicago, Ill.* 8-page brochure discusses advantages of both standard and special types of trucks for use in unusual handling problems; illustrates and describes why some types are better suited for a specific application than others.

32 FLEXIBLE AIR DUCT—*Wiremold Co, Hartford 10, Conn.* 4-page brochure, form 622, covers line for air conditioning, industrial ventilating, and materials handling; also lists specialized types. Selection guide to six types of duct contains information on where to use it, specifications, and typical applications. Engineering features and installation data included.

PARTS AND MATERIALS

● COBALT COMPOUNDS—*Cobalt Information Center, c/o Battelle Memorial Institute, 505 King Ave, Columbus 1, Ohio.* "Properties and Uses of Commercially Available Cobalt Compounds" is a 2-page summary that lists 46 organic and inorganic compounds including the new potassium cobalticyanide, and provides information on their uses, formula, per cent cobalt, molecular weight, specific gravity, crystalline form, melting point, and solubility. Request direct on company letterhead.

● "AN ADVANCED CONCEPT IN MODERN GEARS" — *Philadelphia Gear Corp, Schuylkill Expressway, King of Prussia, Pa.* 12-page booklet describes advantages in using hardened and precision ground gears. Highly accurate gear cutting and grinding facilities with scientific profile and flank control are described; variety of applications illustrated and discussed. Request direct on company letterhead.

33 BEARING UNITS—*Browning Manufacturing Co, Maysville, Ky.* 19-page catalog BU-103 covers line of Relube type bearing units including pillow blocks, high and low height; flange units, both four and two-hole; and take-up units. Most of these units are available in 29 shaft sizes from ½ to 2 7/16 in., and all are available with malleable housings. Detailed specifications, comparison and load rating charts included.

34 SMALL TUBING GUIDE—*Superior Tube Co, 1563 Germantown Ave, Norristown, Pa.* 12-page bulletin 42 is revised edition of company's small tubing "Selection and Application Guide." Summarizes properties of 84 tubing analyses in seven groups: carbon steels, stainless steels, alloy steels, nickel and nickel alloys, copper base alloys, glass sealing alloys, and reactive metals. Also included are concise descriptions of 13 specialty tubing products. Data included on standard tubing size tolerances, lengths, straightness tolerances and tempers.

35 HEAVY-DUTY BALL BEARINGS—*Split Ballbearing, Lebanon, NH.* 8-page illustrated catalog 60 gives details on Type HDR high-precision radial ball bearings with load capacities from 19 to 55% greater than equivalent size Conrad bearings. Offered in ABEC-3 and ABEC-5 precision grades, they are available in Extremely Light, Extra Light, Light, and Medium Series in metric sizes to 85 mm OD. Four ranges of internal clearance are available.

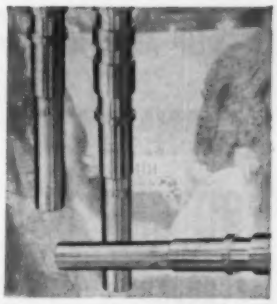
36 3-WAY VALVES—*Airmatic Valve Inc, 7313 Associate Ave, Cleveland 9, Ohio.* 12-page bulletin 91023 describes line of Full Capacity Series for air, oil, water, gas, chemical, or vacuum service. Operating pressure is 0-250 psi; pipe sizes, ¼-1 in. Features, dimensions, specifications, ordering information included.

37 NON-FERROUS CENTRIFUGAL CASTINGS — *Centrifugally Cast Products Division, Shenango Furnace Co, Dover, Ohio.* 8-page illustrated bulletin 157 contains detailed chart showing comparative specifications, chemical analyses, and minimum physical properties of Shenango non-ferrous alloys. Also describes component parts and assemblies regularly produced by the centrifugal method.

38 CYLINDER FOR TOOLING AND AUTOMATION—*Sheffer Corp, 320 W Wyoming Ave, Cincinnati 15, Ohio.* 4-page bulletin 458 pictures and describes lightweight solenoid operated 1¼-in. bore cylinder for air, oil, or water operation said to be particularly suited to tooling and automation. Designated the Valv-N-Hed (R) Series, unit is available in 1, 2, and 3-in. strokes; it measures 6 7/16 in. in length with rod extension for 1-in. stroke x 1⅝ in.; weight is 21 oz.

39 ADJUSTABLE-SPEED DRIVE — *General Electric Co, Schenectady 5, NY.* 8-page bulletin GEA-7012 describes new Parmatic Speed Variator, a compact packaged dc motor drive that operates from ac power. Suitable for a wide variety of drive applications, it features static power conversion, utilizes silicon rectifiers and saturable reactors, and is 25% smaller and 50% lighter than other drives of comparable rating.

"Trying for the thirty-hour week, Higgins?"



HOOVER DAM

call WESTERN UNION operator 25

Your J&L stainless steel distributor can serve you better *because J&L serves him better,* backing him with the full facilities of J&L's Stainless and Strip Division.

Your J&L distributor can reduce your costs by providing a complete range of pre-production services, and doing it economically! He can save you the capital investment required to maintain long term inventories; he can help you eliminate the costs of overhead connected with stocking, accounting, and the inevitable losses incurred through waste and obsolescence due to specification changes.

Technical assistance in solving production problems is also available from your J&L distributor . . . when those problems are connected with an application using stainless steel, J&L's own staff of technical specialists will promptly answer your distributor's call for additional help.

Even when advanced research is required you can call on your J&L distributor in confidence. He will be happy to discuss your problem because he knows he is backed by one of the world's most respected teams of metallurgists—J&L's own staff in laboratories at Detroit and the famous Graham Research Laboratories at Pittsburgh.

Your J&L distributor is as near as your telephone. Call Western Union Operator 25 for the name of your J&L distributor of Consistent Quality stainless steel.

J&L — a leading producer of stainless steel and precision cold rolled strip steels

J&L STAINLESS

SHEET • STRIP • BAR • WIRE

CIRCLE 274 READER SERVICE CARD

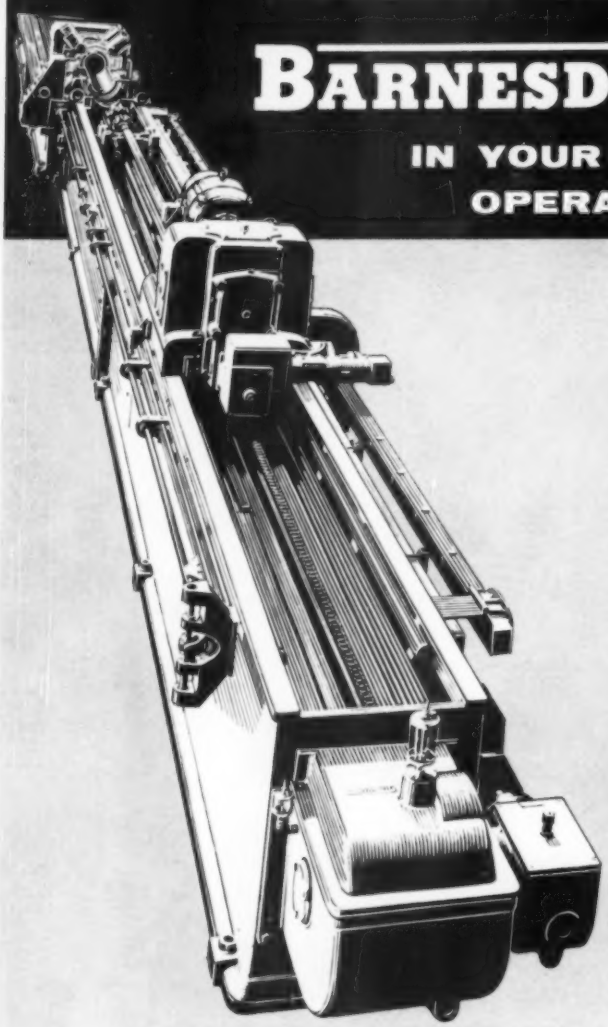
CIRCLE 275 READER SERVICE CARD ►

consistent quality
production
depends on
consistent quality
stainless
steel
Call Western Union by number—ask for Operator 25
for the nearest source of Consistent Quality J&L Stainless Steel
Jones & Laughlin Steel Corporation • STAINLESS and STRIP DIVISION • DETROIT 34

CONSIDER THE ADVANTAGES OF

BARNESDRIL HONING

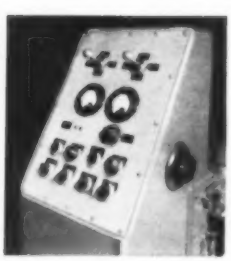
IN YOUR MACHINING OPERATIONS . . .



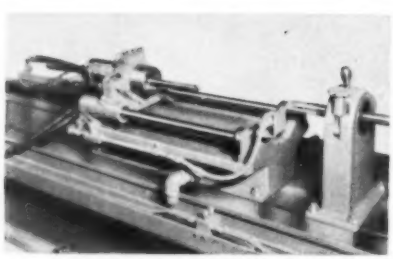
● Fast, accurate, economical metal removal to tolerances measured in tenths of thousandths . . . uniform finishes from 1 to 100 RMS . . . at production speeds. BarnesdriL Honing Machines combine the advantages of geometric accuracy — axial straightness, diametric roundness, and diametric straightness — with metal removal rates comparable to grinding operations. Compensation for stone wear, rapid tool expansion, hone feed, and tool collapse have been integrated as part of the machine function . . . all blended into smooth, fast-reversal stroking by BarnesdriL's exactingly engineered hydraulic drive system.

BarnesdriL Horizontal Honing machines range in size from Model No. 1 with capacity to 11′ length to Model No. 36 for lengths up to 90′. Large capacities and fast metal removal rates make these machines ideal for honing commercial tubing. An additional BarnesdriL feature . . . short stroking at any point in the bore . . . insures a uniform bore size. Electric hone expansion provides continuous control of pressure and automatically compensates for stone wear.

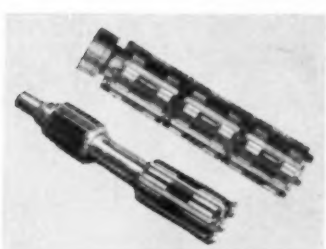
For fast, accurate metal removal . . . consider honing. And, by all means, consider BarnesdriL. We offer a complete line of Vertical and Horizontal machines in a wide range of sizes for internal or external honing. *Write for catalog No. 550 TODAY!*



Speed range and hone expansion can be adjusted electrically in seconds without leaving this conveniently located control panel.



Plugmatic gauging mechanism, a BarnesdriL exclusive, gives positive, automatic sizing from bore to bore on production work.



BarnesdriL engineers can select from a complete line of tools and abrasives to exactly suit your particular honing requirements.

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HONING MACHINES

Honing Machines / Production Units / Filtration Units / Drilling Machines

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DETROIT OFFICE — 13121 Puritan Avenue

Snyder Corp, Detroit, has announced the retirement of **George H Whitehouse** (left) as vice president, sales. He will continue as a member of the board of directors and serve in a consulting capacity. **William C Goeckel**, sales manager, has been named director of sales, succeeding Mr Whitehouse

Van Norman Industries, New Bedford, Mass, has elected **William J Mericka** chairman of the board to succeed **Donald P Hess** who has retired. Mr Mericka, a Van Norman director since Nov 1956, is president of Wm J Mericka & Co, a Cleveland securities firm

NAMES IN THE NEWS...

New Britain Machine Co, New Britain, Conn, has elected **Robert T Frisbie Jr** executive vice president. He was previously vice president, sales. **Frank H Hastings** has been named sales manager for the New Britain-Gridley Machine Division.

Boston Gear Works Division (Quincy, Mass), Murray Co of Texas Inc, has promoted **Edgar V Rankin** from general manager to vice president. **William R Kunkel**, assistant general manager, succeeds Mr Rankin.

C I Hayes Inc, Cranston, RI, has appointed **William C Diman** manager of the Furnace Division. He was formerly service engineer and furnace application engineer.

York Division of Borg-Warner Corp, Chicago, has elected **Edward M Haines** to the newly created post of vice president and assistant to the president. He was formerly associated with General Electric Co.

Beloit Tool Corp, Beloit, Wis, has elected **Henry R Odell** executive vice president. Mr Odell, one of the founders of the company, was formerly associated with Besly-Welles Corp.

Ford Motor Co's Metal Stamping Division has named **Mark Kaiander** manager of the Buffalo stamping plant to succeed **Frank Wright** who has retired. **Charles G Hunter**, production manager for the division's Dearborn stamping plant, succeeds Mr Kaiander as manager of the Monroe, Mich, plant.

Van Keuren Co, Watertown, Mass, manufacturer of precision measuring tools, has appointed **Frank D Clark** director of the newly created Thread Gage and Instrument Division. Mr Clark is a vice president of the company.

Clevite Corp has named **William D Cameron** general manager of the Cleveland Graphite Bronze Division, manufacturer of bearings and bushings for the automotive and other industries. Formerly manager of production engineering for Lincoln-Mercury Division of Ford Motor Co in Detroit, Mr Cameron replaces **Willard W Brown**, recently elected vice president, Bearing Group, of Clevite.

Electric Autolite Co has appointed **Earl L Pressel** manager of manufacturing engineering for the Toledo Division. He was formerly associated with American Radiator & Standard Sanitary Corp as manager of manufacturing engineering at the Detroit Control Division.

Carey Machinery & Supply Co, Baltimore, has elected **William G Hoffman** vice president, industrial supply sales, and **G Cheston Carey Jr** vice president, machine tool sales to succeed **Donald M Munroe** who has retired.

American Drill Bushing Co, headquartered in Los Angeles, has appointed **John S Richard Jr** eastern manager working out of Windsor, Conn.

Seneca Falls Machine Co, Seneca Falls, NY, has elected **Edwin R Smith Jr** president and treasurer. Formerly executive vice president, he succeeds his father, **Edwin R Smith Sr** who has retired after 40 years of service with the company as president, treasurer and director

Brad Foote Gear Works, Chicago, has named **Edgar B Smiley** sales manager. He was formerly a vice president and sales manager of Illinois Gear & Machine Co. **Robert J Byerwalter** has been appointed executive engineer for Brad Foote

better, faster, more economical

HOLES

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GUN/DEEP HOLE DRILLS

Trillions and trillions of straight holes with ultra micro-finish, perfect size, absolute roundness and precision tolerance, *drilled in one operation*, in practically any material: steel, stainless steel, cast-iron, brass, aluminum, plastic, magnesium, titanium and other alloys. Thanks to ELDORADO *production-proved* DRILLS.

ELDORADO DRILLS can solve your 'hole' problem . . . small, large, short or deep, single or multiple set-ups.

ELDORADO with its modern and well equipped research facilities, constantly strives to design and develop better tools to help you eliminate your drilling problems. Avail yourself of this experience.

MADE TO YOUR SPECIFICATIONS:		AVAILABLE FROM STOCK:	
Sizes	.1250" to 2" dia.	1/8" to 1/2" dia. in 64ths	1/2" to 1 1/4" dia. in 32nds
OA Lengths	4" to 120" with dia. limits	10", 16", 22", 36"	16", 22", 36"
Drivers	Std. or to fit your need	.750" dia. x 2 3/4" long	1" dia. x 2 3/4" long
Tips	Carbide	Carbide	Carbide
Now, order from stock, or send in your specifications for a prompt quotation.			

Send for new literature.

Specializing 100% in Gun/Deep Hole Drills and Related Tools,

ELDORADO TOOL & mfg. corp.

(*) *Trade Mark*

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NAMES IN THE NEWS . . .

Dana Corp, Toledo, has appointed **John P Henson** sales manager of the Universal Joint Division. He has been serving as sales engineer in charge of the Ford Motor Co account for the past year.

Bendix Aviation Corp's Friez Instrument Division, Baltimore, has promoted **Arthur S Pawling** from assistant factory manager to factory manager, and **E R Harrall** from manufacturing manager to director of product quality and reliability.

Hughes Tool Co has appointed **Robert A Wagner** manager of the helicopter engineering department of the Aircraft Division in Culver City, Calif. Mr Wagner recently resigned as chief engineer for Hiller Aircraft Corp in Palo Alto.

Norton International Inc has appointed **Jack T Wilber** assistant to the director of manufacturing for Norton products. He moves up from the post of supervisor of process engineering at the company's Plant 7.

Lea Manufacturing Co, Waterbury, Conn, has appointed **S Lewis Doughty** manager of electrochemical sales for the entire country. Formerly eastern manager, headquartered in Waterbury, he has been responsible for sales and technical service for the electroplating processes developed by Ronal Chemicals and Lea-Ronal Inc. **John Guss,** formerly western manager, has been named manager of electrochemical service for the country. He will continue to make his headquarters at Lea-Michigan Inc in Detroit.

General Motors Corp has named **Harry D Hall** director of manufacturing development. **Ronald A Featherstone** has been appointed chief engineer of manufacturing development to succeed Mr Hall.

Ampco Metal Inc, Milwaukee, has named **Henry C Fechtmeyer** a vice president. He has headed the general sales division of the bronze alloy producing firm since 1955.

Gaertner Scientific Corp, Chicago manufacturer of precision optical and measuring instruments, has elected **Robert E Steinman** vice president. Mr Steinman was formerly associated with Charles Bruning Co, Mount Prospect, Ill, as product manager.

COMPLETELY NEW SERIES 300

PEER

UNI-STRUT SPOT WELDER THE MOST VERSATILE WELDER EVER BUILT!

HERE'S PROOF!

Adjustable Throat and Continuous Heat Control For Efficient, Precision Welding!

PATENTS PENDING

EXCLUSIVE PEER UNI-STRUT CONSTRUCTION provides the most rigid structure ever available on a spot welder. Adjustable Throat design enables the user to move arms in or out; lower arm may be raised or lowered. Continuous heat control is a standard feature which offers an infinite number of welding current adjustments. Current can be reduced far below other standard machines giving much wider welding range.

CONVERTIBLE FOOT—AIR ROCKER—AIR PRESS—Whatever your needs, the Peer *Uni-Strut* welder may be easily *converted* in the field quickly without drilling holes, welding or similar construction. Just install the appropriate conversion kit; you protect your original investment.

NEW TRANSFORMER—More compact, more efficient, Silicone Class *H* insulated *high-power factor.* Available for 220/440 volt standard or other voltages.

• Concealed water hose • All controls visible and accessible from front • Easily serviced—any part removed without disturbing other components • New slim-clearance ejector-type electrode holders • More welding capacity over a wider range • Storage space for spare tubes, tips, etc.

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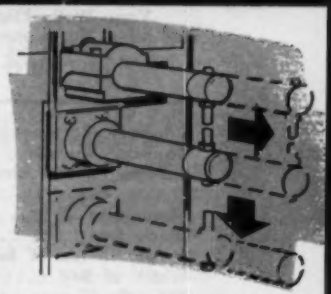

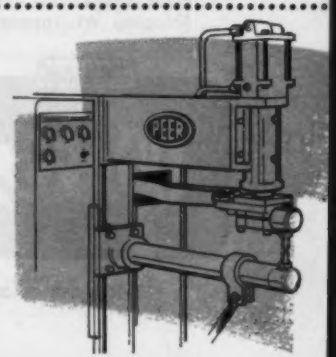

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The simple design and rugged construction of every "Wellsaw" didn't just happen. We planned it that way! Over 30 years of specialized band saw experience and know-how is your assurance of the quality and service with each machine produced by Wells Manufacturing Corporation.

There is a Wells Saw of the right style, capacity and speed to do a better, more economical job for you. Wells Saws will deliver long, dependable service. Operating and maintenance costs are very low.

Your Wells Distributor will help you analyze your requirements and select the proper model Wells Saw for your jobs.

TWO WIDELY USED WELLS SAWS

	MODEL 600	NO. 8
Capacity, Rectangular	6" x 13"	8" x 16"
Capacity, Rounds	6¾"	8"
Speeds: Ft. Per Minute	50, 90, 160, 250	50, 100, 175, 275
Motor Size	1/3 H.P.	½ H.P.
Blade Size	⅝" x 8'2½"	¾" x 11'6"
Height to top of Bed	25½"	25½"
Width of Bed	8½"	10¼"
Floor Space	21" x 50"	24" x 72"
Shipping Wt. (approx.)	425 lbs.	650 lbs.

Wells saws
Wells ®

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METAL CUTTING BAND SAWS
WELLS MANUFACTURING CORPORATION
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NAMES IN THE NEWS . . .

Penn Scientific Products Co. Abington, Pa, industrial diamond products firm, has elected **Nathan H Koslow** president. Mr Koslow will continue to serve as president of Associated Sales Co of Richmond, Va, but will make his headquarters in Abington.

National Tool & Die Manufacturers Association has appointed **Jack Kleinoder,** Volkert Stampings Inc, New York, vice chairman of the Planning and Policy Committee. Mr Kleinoder is a past president of the association. **Centre W Holmberg** of August W Holmberg & Co, New York, is new chairman of the Federation Committee; **Henry J Meyer,** Woodhaven Metal Stamping Co, Brooklyn, has been named chairman of the By-Laws Committee; and **Arnold Buttner,** Instrument Systems Corp, New York, is new vice chairman of the Safety Committee.

AC Spark Plug Division of General Motors has promoted **Alvin B Goodspeed** from director of contracts to director of sales. He succeeds **Moreton B Price** who has been named director of sales for GM's new Defense Systems Division. **John F Carr,** assistant divisional controller, takes over Mr Goodspeed's former duties.

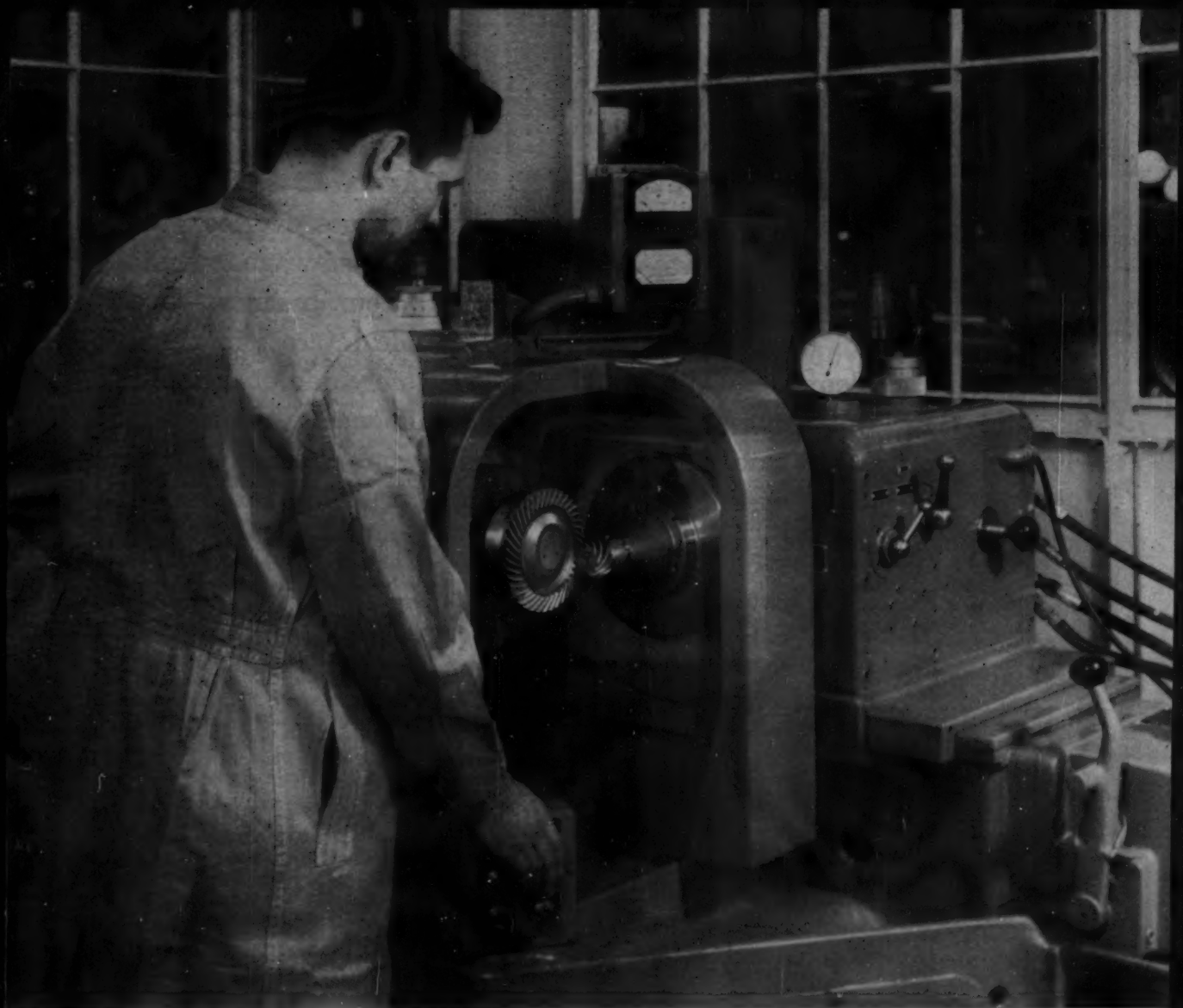
National Screw Machine Products Association has elected **Charles L Kerr,** president of Kerr-Lakeside Industries Inc, Cleveland, president of the association. **Harry G Smith,** president of Curtis Screw Co, Buffalo, has been elected vice president of NSMPA.

Pacific Airmotive Corp, Burbank, Calif, has elected **Robert L Earle** executive vice president. Mr Earle was formerly executive vice president of Marquardt Corp.

American Motors (Canada) Ltd has named **W H Shotton** works manager of the Rambler plant at Brampton, Ontario.

Stone Machinery Co, Manlius, NY, has named **C W Snyder** district manager in charge of the western region with headquarters in Los Angeles.

Zimmerman & Gaumond Inc of Chicago, manufacturers' representative of production machine tools, has appointed **Mark J Rodman** to represent the firm in the Chicago area and **A E Mundt** to handle Z&G operations in the State of Wisconsin.



Now you can *speed-test* gears up to 4000 RPM

Since the accuracy of any gear test depends on how well it simulates actual operating conditions, we've developed a hypoid tester with speeds up to 4000 RPM. The higher range of speed on the No. 17A-4000 Hypoid Tester makes possible a new standard in the testing of bevel gears.

Complete testing on one machine. The No. 17A-4000 Hypoid Tester is arranged for both power and slow rolling tests. With the power test you can observe a gear's smoothness of operation, its noise characteristics, and its tooth contact pattern.

Roll test the gear and you get accurate readings of its eccentricity, tooth size, spacing, and profile.

With the No. 17A-4000 Tester you can test any right angle straight bevel, Zerol® bevel, spiral bevel and hypoid gear of any pitch and up to 20″ OD.

Pre-set backlash control. The No. 17A-4000 Tester has a new hydraulic backlash control mechanism. The control automatically duplicates your pre-set backlash value when you change the relative positions of a gear pair to simulate actual operation.

Exact duplication of settings. Indicator set-up fixtures are available for large quantity testing. With these gages you can make identical settings on a battery of machines, or get the same setting repeatedly on a single machine.

New bulletin. We've prepared a bulletin on the No. 17A-4000 Hypoid Tester to answer any questions you might have about its construction or operation. Write for a copy.

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Last year, traffic accidents killed 37,000, injured 1,400,000

. . . and they wasted Five Billion Dollars!

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Where traffic laws are strictly enforced, deaths go DOWN!

Published in an effort to save lives, in cooperation with the National Safety Council and The Advertising Council.

NEW BOOKS...

FBI REGISTER OF BRITISH MANUFACTURERS, 1960, (32ND EDITION). *Published by Kelly's Directories Ltd, 186 Strand, London WC 2, and Lliffe & Sons Ltd, Dorset House, Stamford St, London SE 1, England. 1164 pages 7 x 9¼. Price $7.50.*

Although distribution of this book is normally restricted to official bodies in the US, copies can be obtained by private industries, and it fulfills an important function in these days of increased trading relationships between the US and the UK. Somewhat larger than last year's edition, it follows the established pattern of providing an alphabetical list of products and services, with the names of suppliers given under each heading. This is followed by language glossaries in French, German, and Spanish in which the foreign name is followed by a number corresponding to the number assigned to each product classification.

In Section 4, companies are listed alphabetically with their addresses, telephone number, and telegraphic address. Also included are a list of trade asosciations, brand and trade names, and trade marks.

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PRODUCT ENGINEERING DESIGN MANUAL—*Edited by Douglas Greenwood, Associate Editor, Product Engineering. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, NY. 340 pages, 8½ by 11 in. Price $9.*

This over-size, profusely illustrated volume, a collection of design-file pages published in *Product Engineering* magazine over the past few years, contains more than 100 product-design topics. The designer and engineer should find it extremely useful as a guide to solution of everyday design problems. Inventors and patent attorneys, too, could benefit from the design information in the manual.

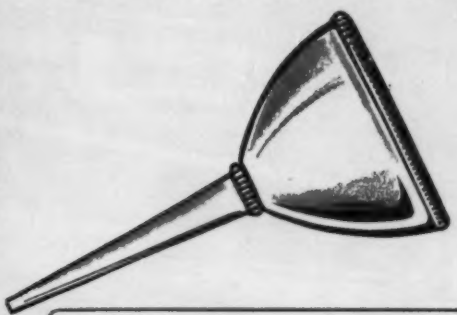
Detailed chapters, fully illustrated by drawings, take up such topics as assembly, clutches, couplings, bearings, electronic components, springs, and drives. The discussions give the design engineer the "feel" of a design problem: they show what design is good, what has been done by other designers, and what design elements are acceptable. The orderly arrangement divides the manual

JARVIS UNVEILS A REVOLUTIONARY DESIGN IN COLD FORMING TAPS!

NEW JAR-FLO

LUBE-GRUV® TAPS

LUBRICATION GROOVES MAKE CHIPLESS FORMING OF INTERNAL THREADS AS EASY AS CONVENTIONAL TAPPING!



NOW, for the first time, cold forming taps that give *full time lubrication* to the *forming contact* area during the *full* tapping cycle.

LUBE-GRUV® gives you a *far superior finish* on the formed threads than is possible with conventional cold forming taps.

USE CONVENTIONAL TAPPING EQUIPMENT. The combination of *positive lubrication* and *narrow contact* surface makes the forming of internal threads much easier than with ordinary cold forming taps. Jar-Flo with LUBE-GRUV has less drag, requires less driving torque.

LUBE-GRUV® Jar-Flo TAPS FOR CHIPLESS FORMING INTERNAL THREADS IN DUCTILE MATERIALS—STRONGER THREADS—NO CHIPS—AVAILABLE IN PLUG OR BOTTOMING TYPES

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Company.....

Individual.....

Street.....City.....Zone.....State.....

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into fourteen chapters, each containing several related articles.

Depth of coverage can be illustrated by listing the contents of Chapter I, "Accessories": "Adhesive Applicators for High-Speed Machines"; "Bead Chains for Light Service"; "Thirteen Ways to Use Metallic Bellows"; "Retaining and Locking Detents"; "Frictional Supports for Adjustable Parts"; "Seven Basic Hoppers for Parts"; "Nibs and Catches for Lids on Sheet-Metal Containers"; "Plugs, Caps and Covers"; "Applications of Ultrasonic Transducers"; and "Selecting Vibration Isolators."

As a handy, easy-to-use reference book, the manual rates an important place on any design bookshelf.—TJ

•

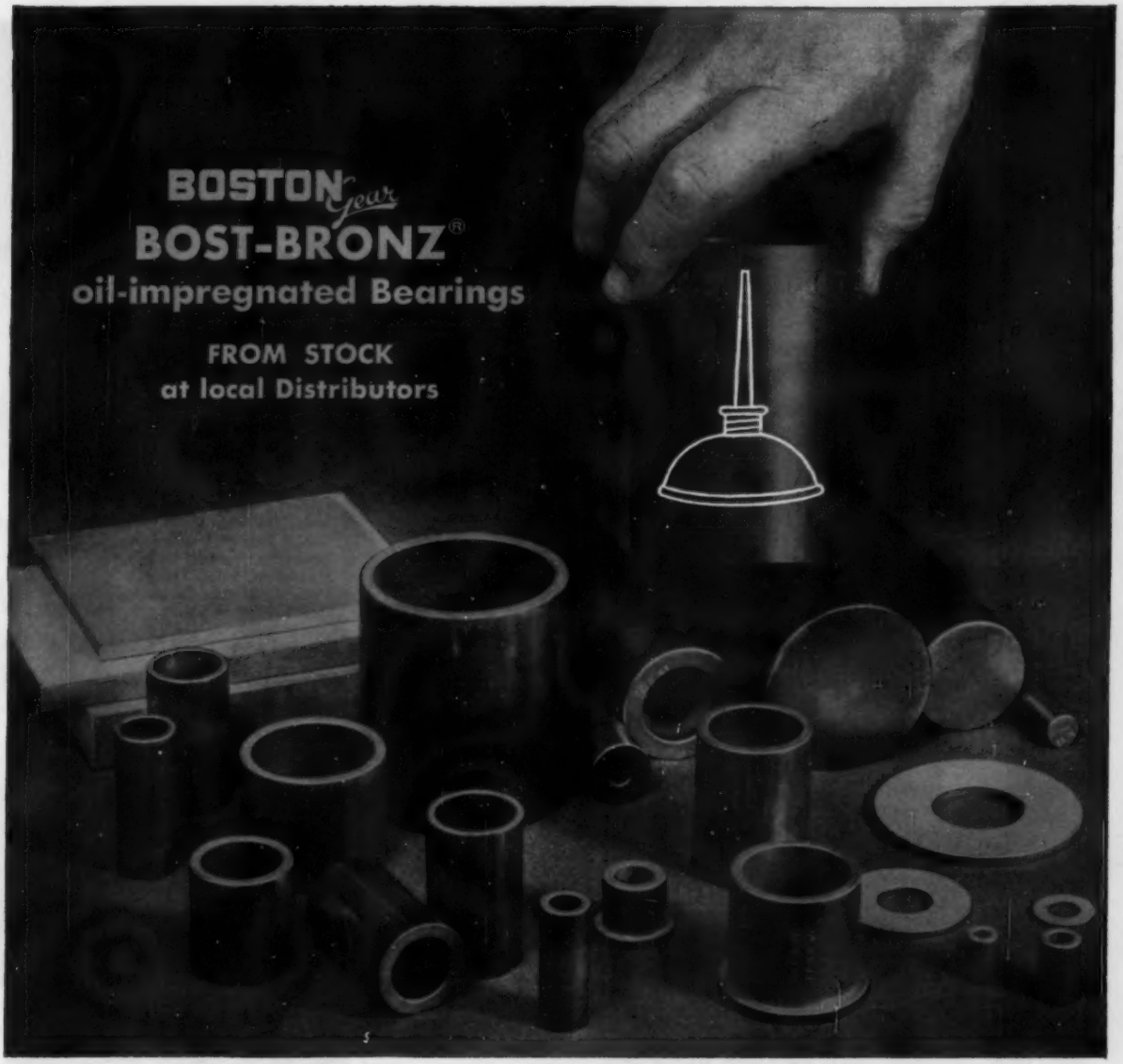
KEMPE'S ENGINEERS YEAR-BOOK, 1960. *Published by Morgan Bros (Publishers) Ltd, 22 Essex St, Strand, London WC 2, England. 2 Vol, cased. 3000 pages, 4¾ x 7. Price $12.60.*

Although intended primarily for the British engineering profession, this old established reference book should prove particularly valuable to American companies in view of the increasing cooperation between British and American firms, with cross-licensing agreements and mutual exchange of products.

That it can be issued in a new edition, year after year, is certainly proof, not only of its basic soundness, but also of the skill and energy of its editors in keeping right up to date with the latest developments in each of the many fields it covers. It is proof, also, of the rapid pace of engineering evolution, and of the need for engineers to discard their old, well worn copies of handbooks if they, too, wish to keep abreast of modern technology.

In this latest edition there are new chapters on electronic engineering, nuclear power, naval architecture, railroad brakes, railroad signals, and diesel locomotives and railcars.

Additions have also been made in older chapters by including the latest information on high-temperature steels, cutting fluids, ceramic tools, tube benders, skids and trucks, high-pressure flow meters, and testing machines. The Water Engineering section now includes new material on the base exchange process of water softening; under Refrigeration there is a section on Performance of Refrigerants; and there are also numerous changes and additions brought about by the issue of new and revised British standards.—HEL



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the bearings with the "built-in" oil supply

For all types of bearing products

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BEAR-N-BRONZ
Solid Bronze Bearings
BALL BEARINGS
Sheaves Wheels
PILLOW BLOCKS
FLANGED CARTRIDGES
your best buy is nearby

BOST-BRONZ is BOSTON Gear's improved, all-purpose, porous bronze bearing metal. Oil-impregnated, it maintains a constant uniform film of lubrication over the entire bearing surface. You get BOST-BRONZ bearings FROM STOCK, install them and forget them.

YOU SAVE the time and expense of reaming to fit, and of machining oil grooves and oil holes. You end "too little or too much" oiling by careless operators, and avoid oil drip and contamination or damage of food, textiles, etc.

The BOSTON Gear Catalog lists BOST-BRONZ plain, flanged, and thrust bearings, cored and solids bars, and plate stock in 649 standard stock sizes. Ask your BOSTON Gear Distributor for complete information. Boston Gear Works, 60 Hayward St., Quincy 71, Mass.

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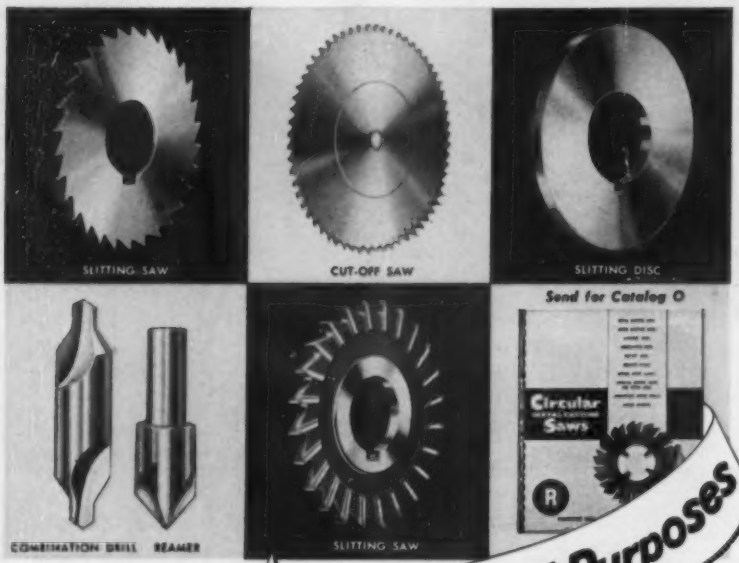

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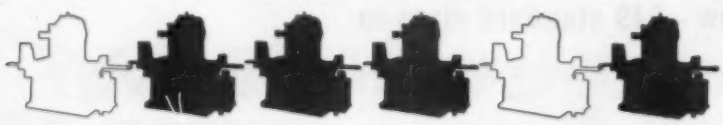

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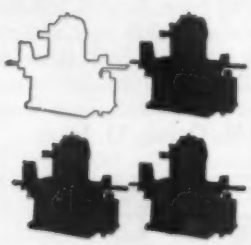

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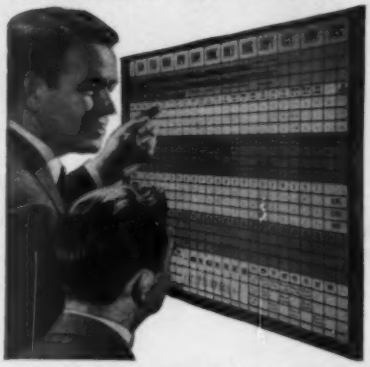

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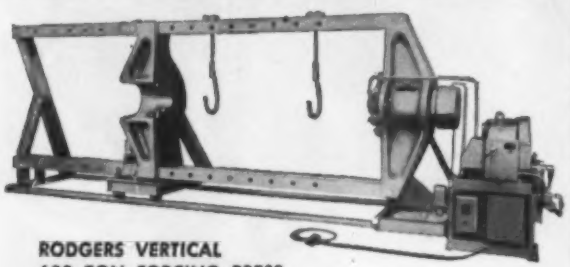

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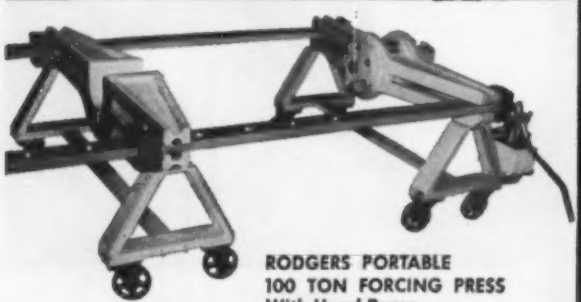

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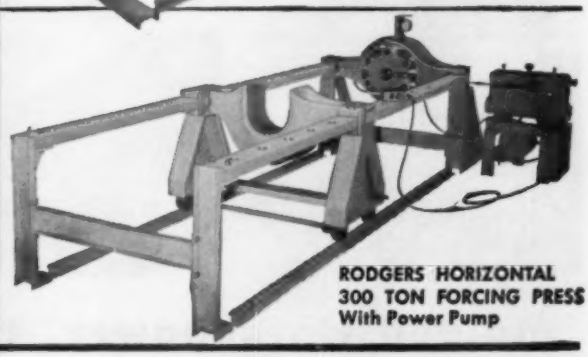

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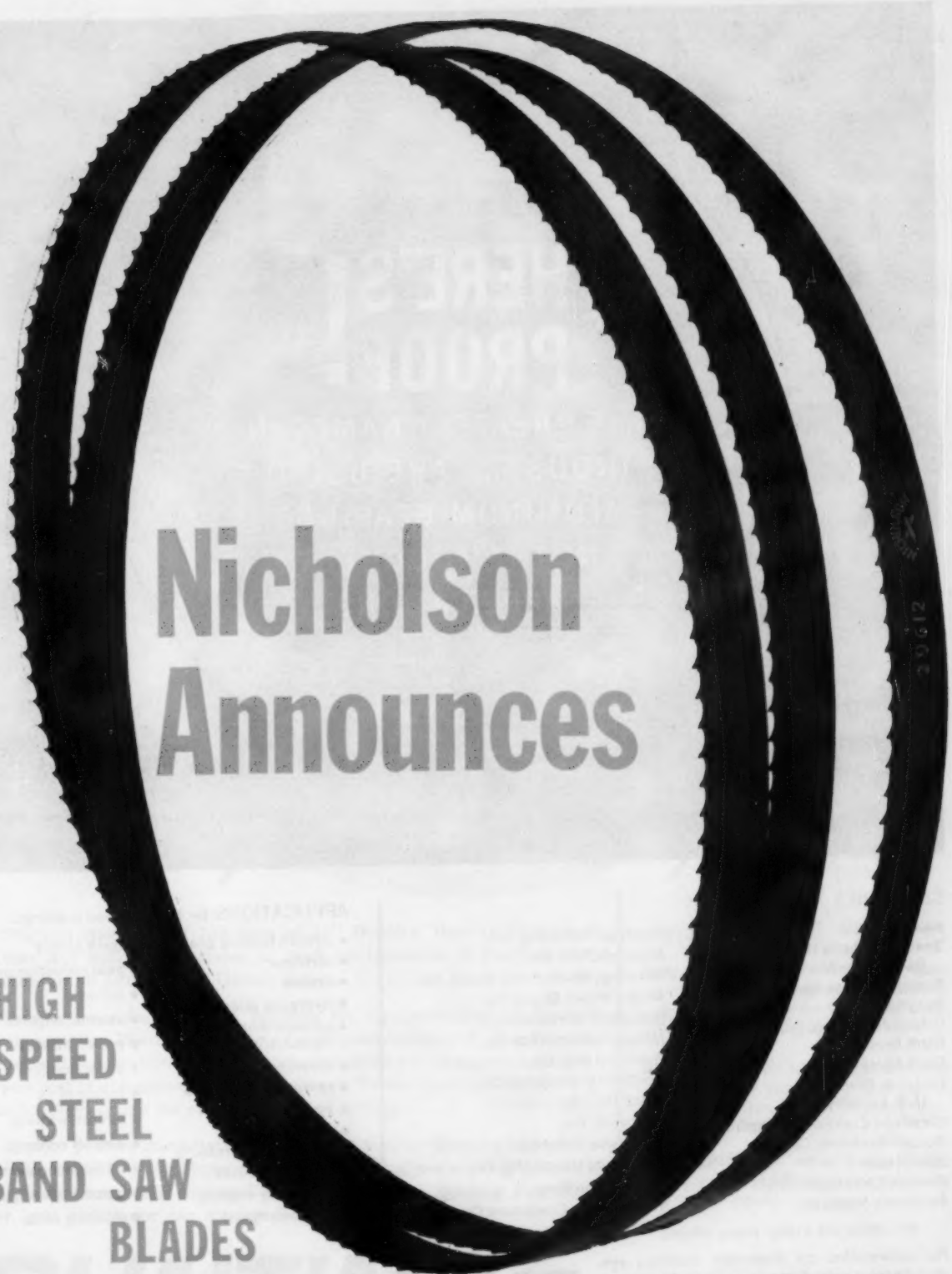

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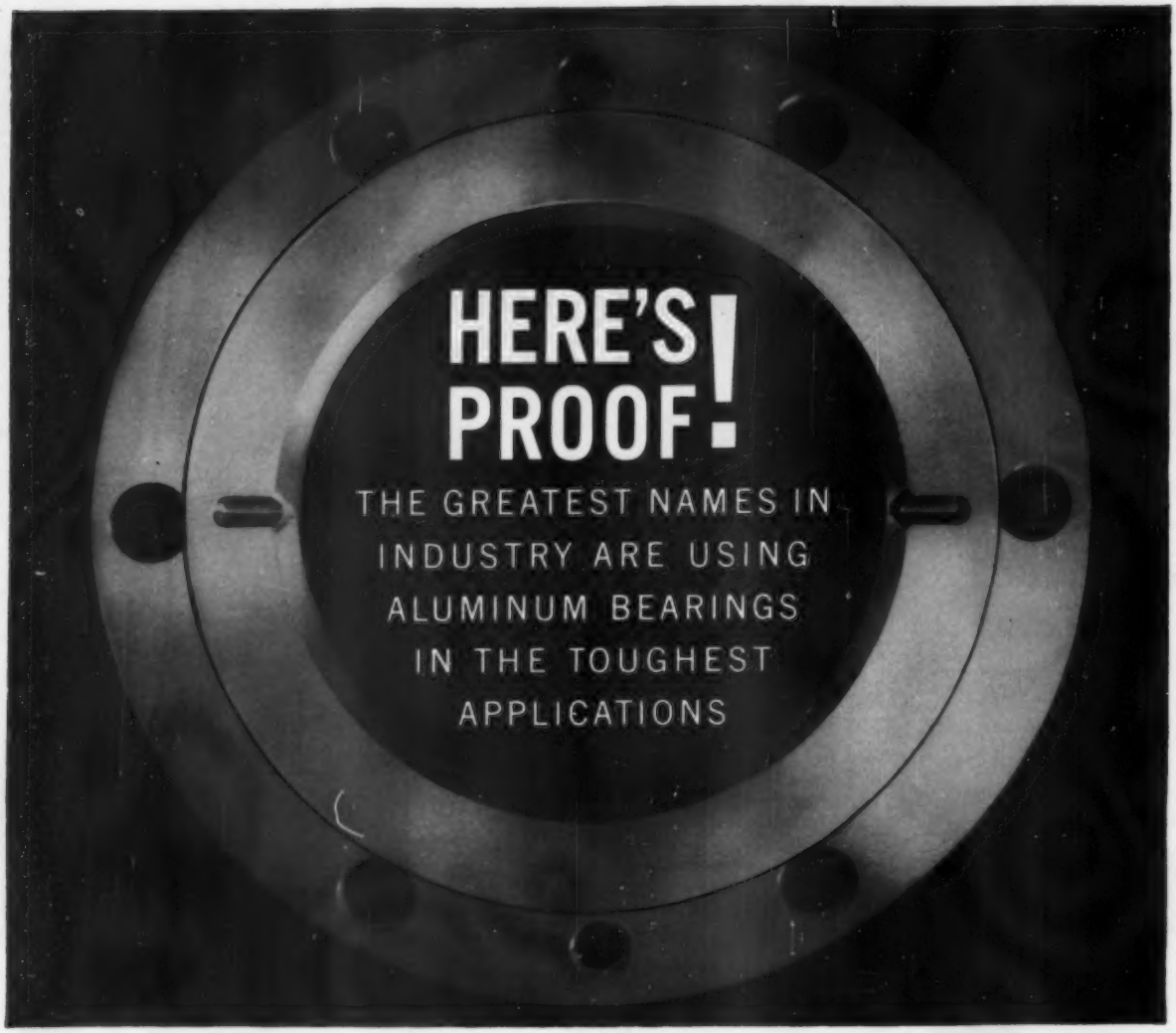

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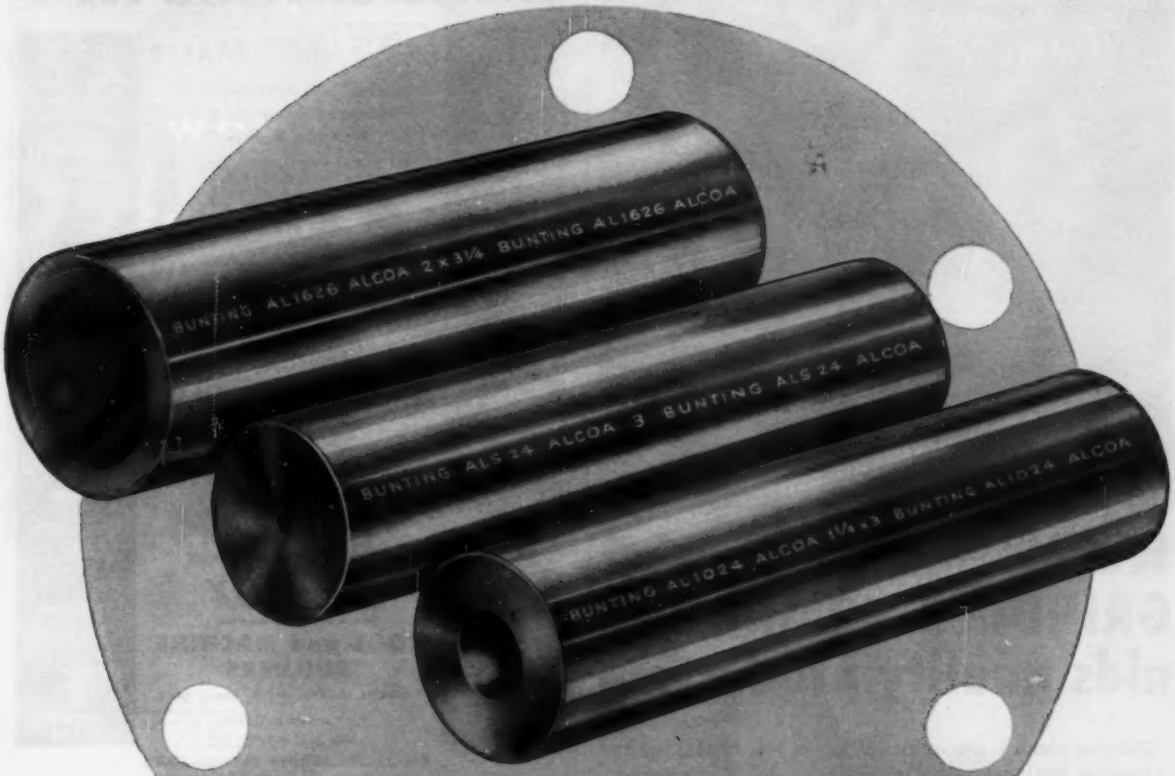
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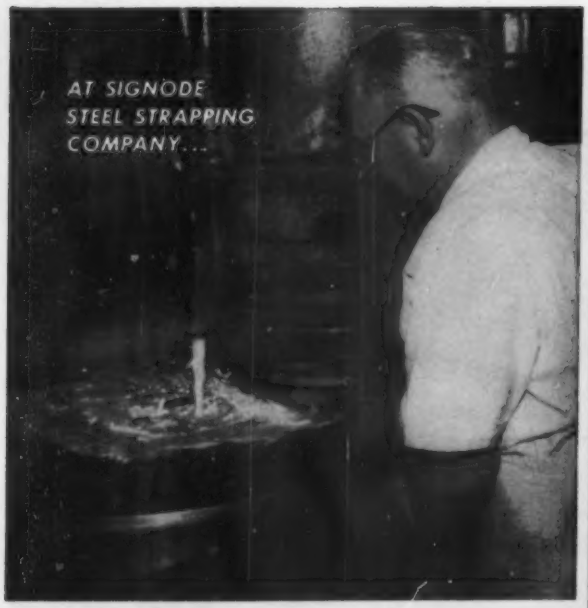

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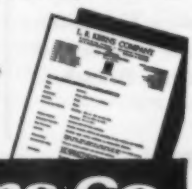

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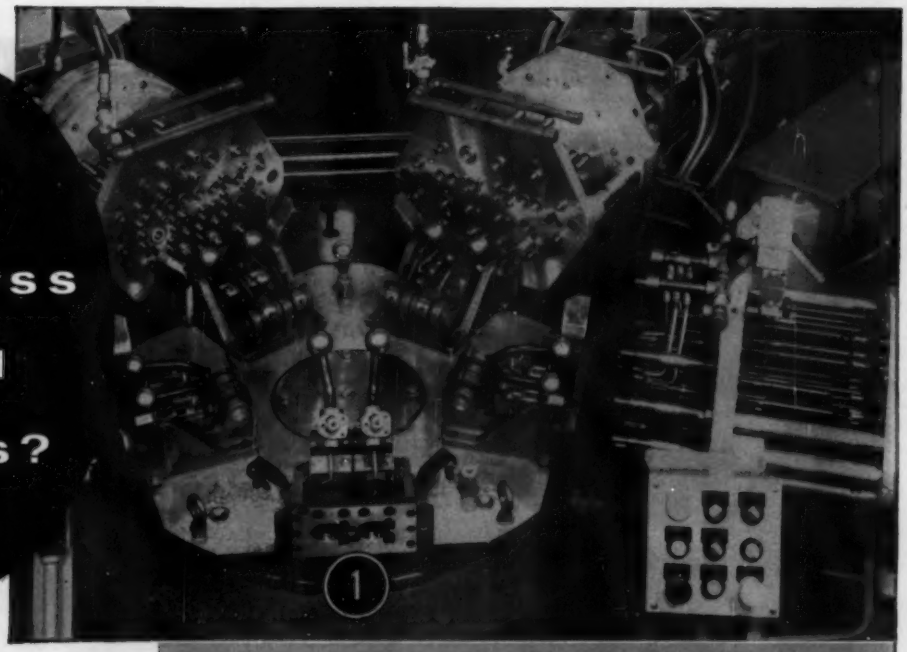
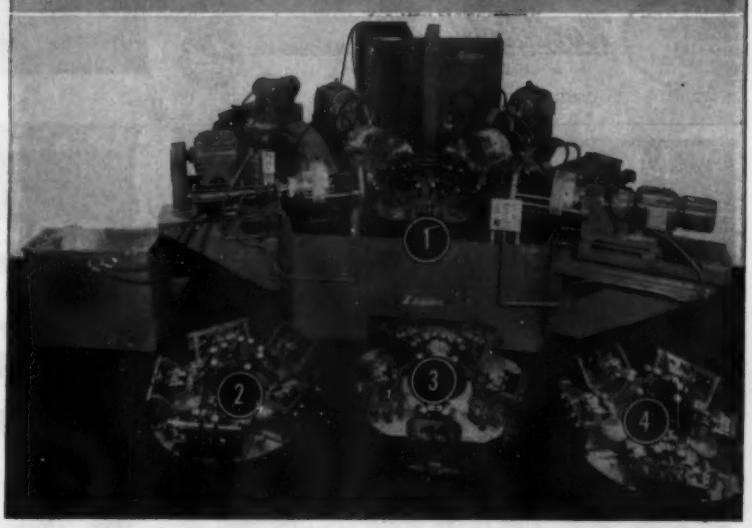


Four fixture assemblies, mountable on a common index table, have five stations each for drilling, reaming, and tapping left- and right-hand cylinders at 400 pieces per hour. In all, 2800 holes are produced.

because **Zagar** *design uses more spindles in smaller space with minimum tooling and requires short change-over time*



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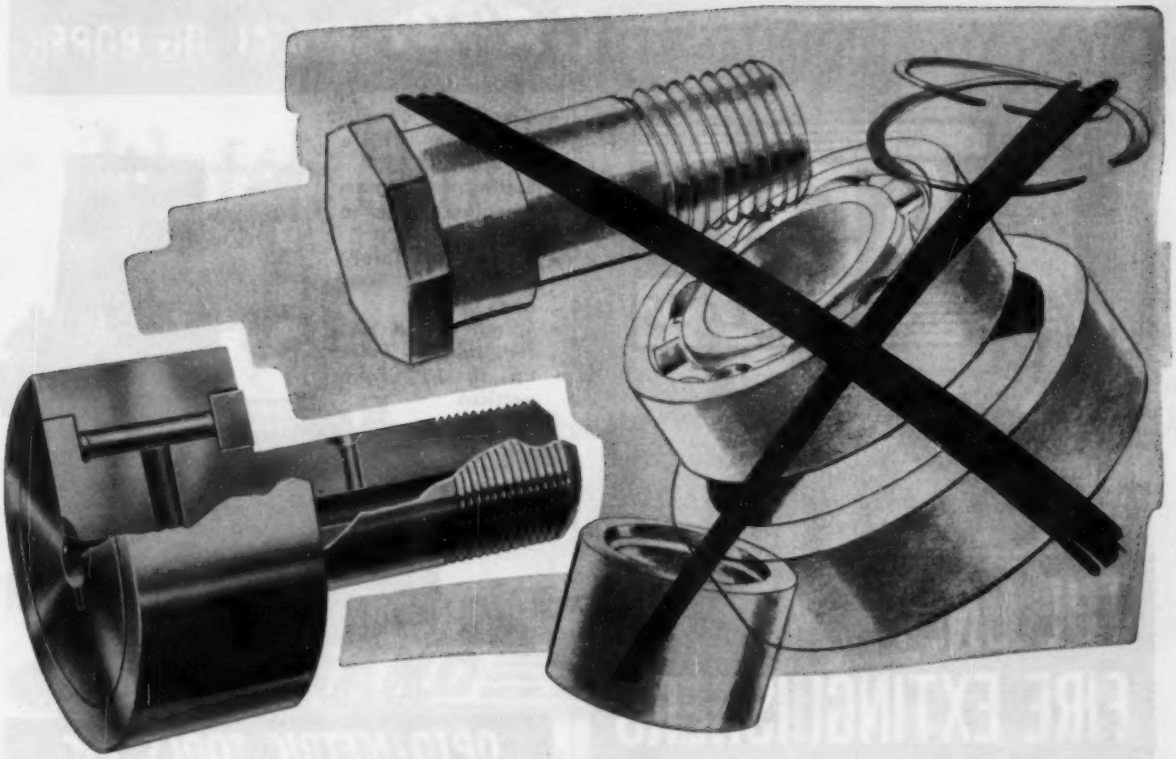

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eliminate the cost of producing and assembling improvised cam follower, track and guide roller units

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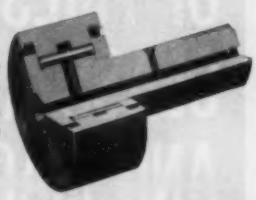

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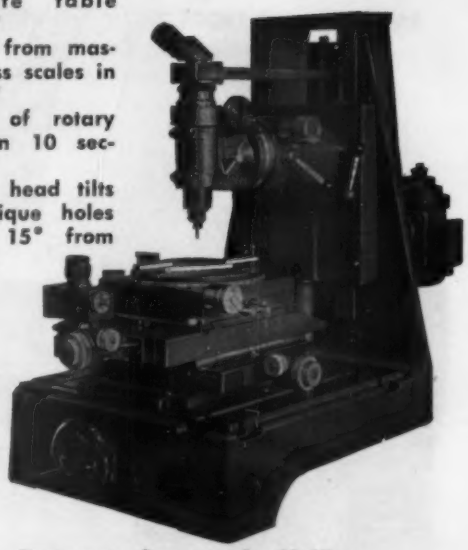

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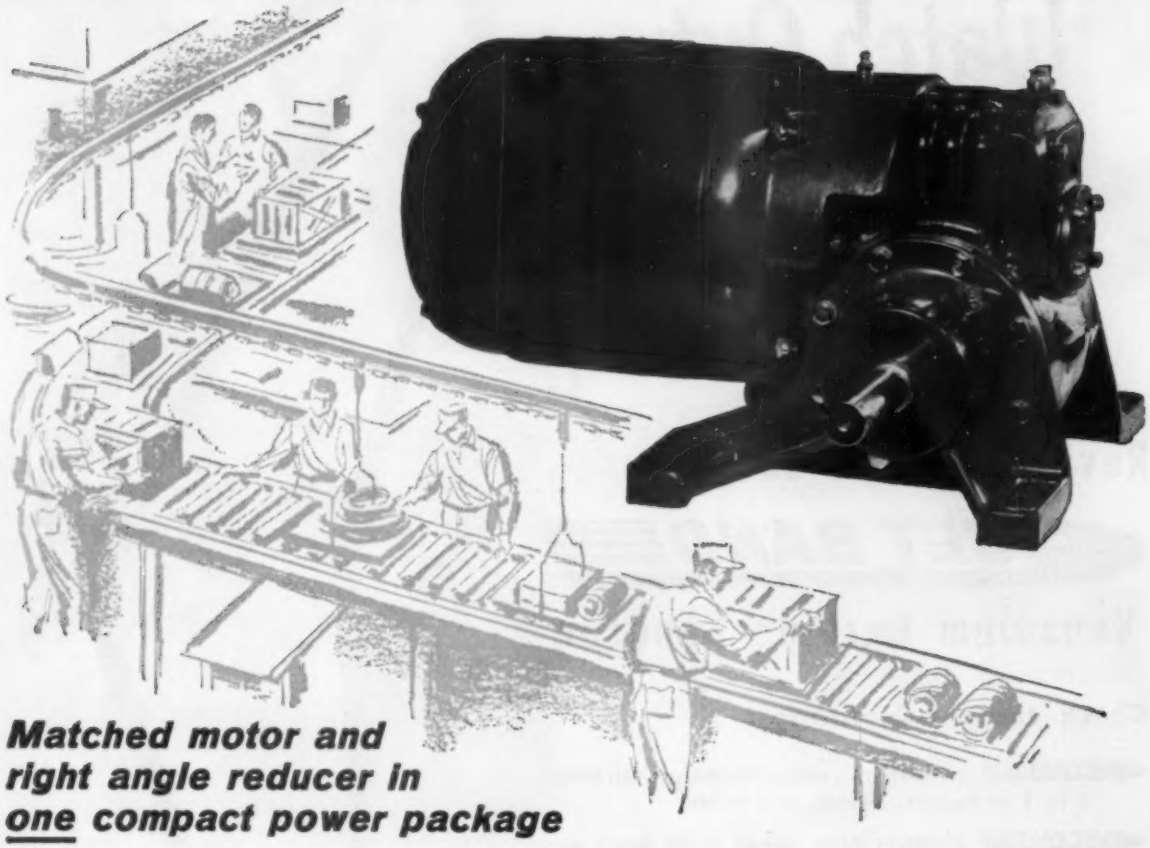

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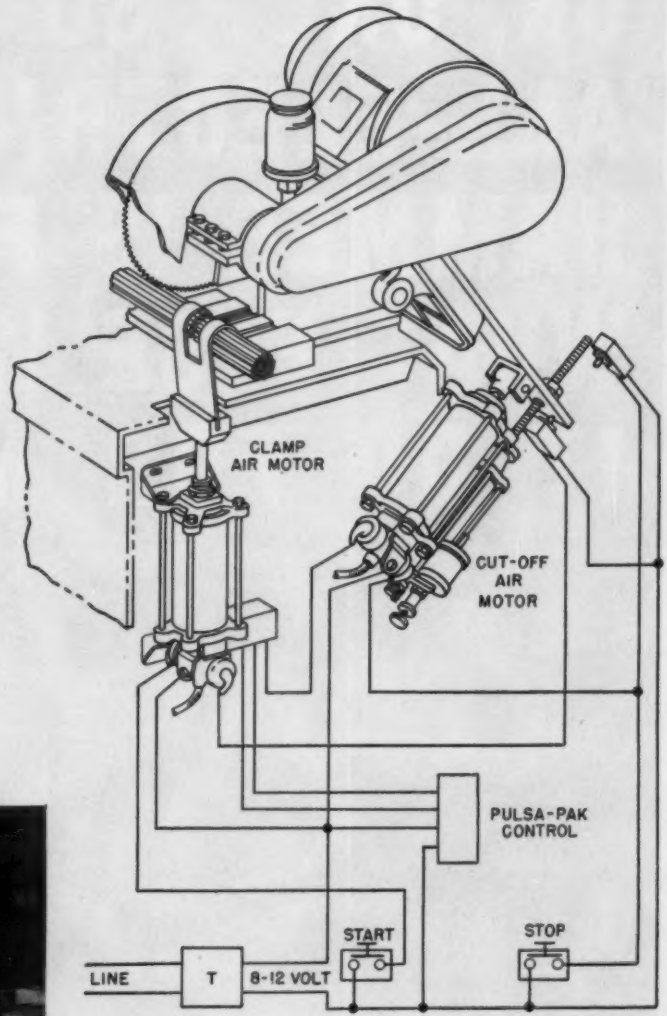
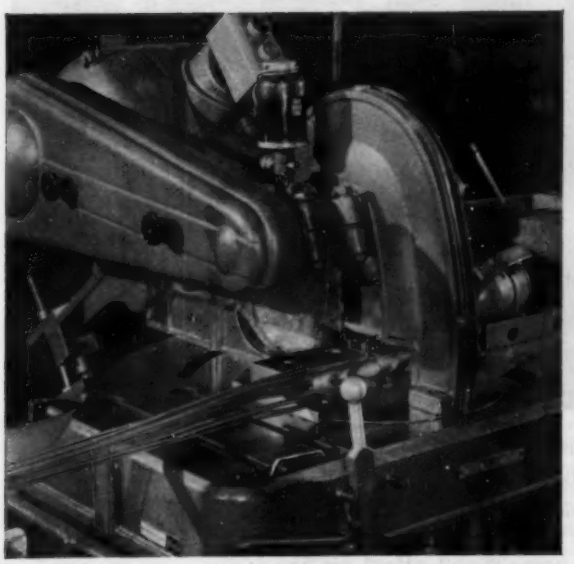
HOW TO MAKE A CUT-OFF SAW PRODUCE MORE AT LESS COST

Shown at the right is a SPOT-A-MATION IDEA used in many plants. Almost invariably it has meant cost savings of 50% or more—has improved product quality, lengthened saw life, lessened worker fatigue.

Two Bellows Air Motors are used. One, hydraulically controlled, feeds the saw through the work. The second clamps the work in position. The two Air Motors are electrically interlocked. The cut-off saw can be made completely automatic by adding a third Air Motor to feed the material.

This is another typical way Bellows Air Motors are used to "Spot Modernize" existing equipment. Almost any hand-fed, or hand-controlled machine can be made to produce more, at less cost, with versatile Bellows "Controlled-Air-Power" Devices.





Typical application of this SPOT-A-MATION IDEA in the plant of Milwaukee Gas Specialties where gas tubing is cut to length. Here costs were cut better than 50% and cost of rejected material reduced 20%.

THIS SPOT-A-MATION IDEA FILE IS YOURS ON REQUEST

Contains drawings, circuit diagrams, equipment list, and full details to enable you to convert existing equipment to lower cost operation. Write for it today. No obligation.

Address Dept. AM560, The Bellows Co., Akron 9, Ohio.

The Bellows Co.

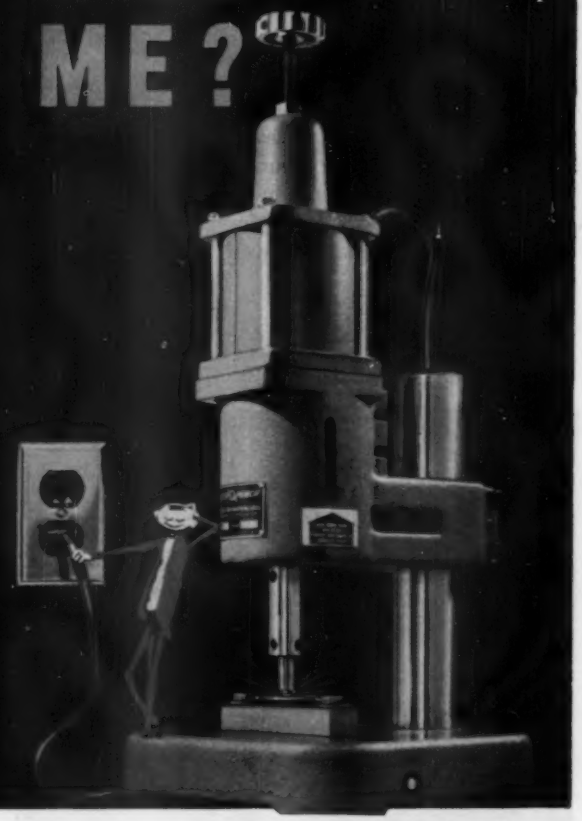
DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

AKRON 9, OHIO

1284-B

OTHER INDUSTRIAL DIVISIONS OF IBEC: Sinclair-Collins Valve Co., Valvair, Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio

OK, OK . . . SO YOUR NEW ALL-ELECTRIC IMPACT HAMMER IS FAST - BUT WHAT ELSE WILL IT DO FOR ME?



Fair question. ELECTROPUNCH is fast. Up to 300 controlled blows per minute. Up to 10,000 lbs. impact. Swift lift for any light assembly production line. But not just fast. No. Versatile. Excellent for staking, riveting, punching, swaging, crimping, marking, etc. Mobile, too. Oh yes. Takes up mere square foot of bench. Fits any production line — just plug it in. Electric, you know. Won't affect air line requirements. Never have to buy new air compressor or any of that costly business. Saves utility costs like bees save honey. . And, speaking of saving: No maintenance. Just two moving parts — yet durable as Gibraltar. Easy, effortless operation — but really effortless. Easiest of all on budget. Blush to mention actual figure. But cost is lower than for any comparable equipment. Get facts. Write: **BLACK & WEBSTER, INC.** Dept. 3, 570 Pleasant St., Watertown 72, Mass.
PHONE: WALNUT 6-0100

NEW IMPROVED SERIES 4 ELECTROPUNCHES -- MODEL 85
Impact, 3500 lbs. (others to 10,000 lbs).
Length of stroke — 1¾"
Cycles per minute, full stroke — 120
Maximum shut height — 5½"
Column Height — 12"
(18" column slightly extra)
Throat depth — 4"
Tool hole in spindle — .500-.502x 1" deep
Bench space — 9¾" x 9¾"
Weight — 50 lbs.
Power consumption — 111,000 strokes for 1 KWH
115V., or 230V., AC, 50-60 cycle, 1 phase

Alcoa puts the metal where you want it

How BIG an impact have you seen lately? Alcoa can now make them up to 12 in. in diameter and 60 in. long.

When Alcoa's new 2,500-ton press hits an aluminum alloy slug, a giant impact is formed with the combined strength of an extrusion and forging.

Like their small brothers, these big new impacts can save you money. They are produced in one fast operation. There's no parting line to be ground. No scale to be removed. No draft to be cut off. Impacts have forged bases and extruded sections. Multiple parts can often be combined into one integral impact eliminating welded or mechanical joints. Machining is reduced, and excessive material waste is eliminated.

You can get these big new Alcoa® Impacts in many alloys with tensile strengths up to 75,000 psi. Also made from aluminum powder metallurgy alloys which provide excellent properties at elevated temperatures.

Alcoa Impacts are unfailingly sound. They have smooth, corrosion-resistant surfaces. You can have them in plain or complex shapes with design features combining those of forgings and extrusions—flanges, steps, multiple walls, bosses, ribs.

In impacts, as well as forgings, castings, extrusions and screw machine parts . . . Alcoa puts the metal where you want it. A call to Alcoa can mean ingenious design solutions. Start now; write for *Metal in Motion*, Alcoa's new 34-page brochure on impacts. Aluminum Company of America, 911-E Alcoa Building, Pittsburgh 19, Pa.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

Alcoa puts the metal where you want it . . . in impacts, castings, forgings, extrusions and screw machine parts.

EYES ARE EXPENSIVE TARGETS!

See How Western Electric Cut Eye Accident Rate 36% With Low-Cost AO Eye Protection Program

THE INSTALLATION ORGANIZATION of Western Electric Company employed 15,585 field employees in 1955 and 22,391 in 1958. Operations include erecting steel frames, mounting telephone switching equipment on the frames, cabling, connecting wire ends and thoroughly testing the finished job before turning it over to a Bell Telephone Company. Chief eye hazards are being struck by tools if wire breaks, exposed and protruding wire ends, solder splashes, flash burns and drilling.

In 1955, before a complete eye protection program was installed, the frequency rate for eye accidents was 15.9. In 1958, with all field forces equipped with safety glasses, the frequency rate dropped to 10.2. Frequency rate is the number of accidents times one million divided by the number of working hours.

Yes, industrial eye protection pays off. It saves eyes, pain, grief, skills — and dollars in compensation and medical costs. (In larger companies, dollar savings in five figures annually are not uncommon.) And when you install a program be sure you get the safety you pay for — in *safety standard frames and lenses.* Look for the ◊ Trademark. Write for new booklet "Eyes Are Expensive Targets".

American ◊ Optical
COMPANY
SAFETY PRODUCTS DIVISION
SOUTHBRIDGE, MASSACHUSETTS
Safety Service Centers in Principal Cities

Always insist on ◊ Trademarked lenses and frames

SET KNIFE CLEARANCE AT 8% OF METAL THICKNESS

Turning hand crank "A" changes knife clearance "C". This is indicated on gauge "B". There are no bolts to loosen, no parts to move. The adjustment is easily made in 10 seconds.

8% is a good figure to remember when shearing mild steel. By adjusting the clearance between the knives to 8% of the thickness of steel being cut, you will get the best cuts and the knives will stay sharp longer.

Because of the importance of having the right knife clearance for every shearing job, Steelweld Shears were designed to make this adjustment extremely easy. In fact, it can be made in 10 seconds. Consequently, it becomes a natural routine part of a shear operator's job.

You will find this feature invaluable if you shear various thicknesses. It eliminates the need of working with some fixed compromise knife clearance setting with resultant cuts that vary from the ideal more or less as the knife adjustment is off from the correct setting.

Steelweld Shears are the most modern on the market today with more features that make for speed, accuracy and long trouble-free operation. Some of their fine features are not obtainable in any other machine.

Series 8D-12 Steelweld Shear for cutting steel to 12' x ½". A stainless steel plate 7' x ⅜" is shown being cut. Various thickness plates, as well as heavy steel grating, are also cut on this machine, which is in a West Coast plant. Knives on this hard-working shear last 3 to 6 months before they need to be turned to another cutting edge.

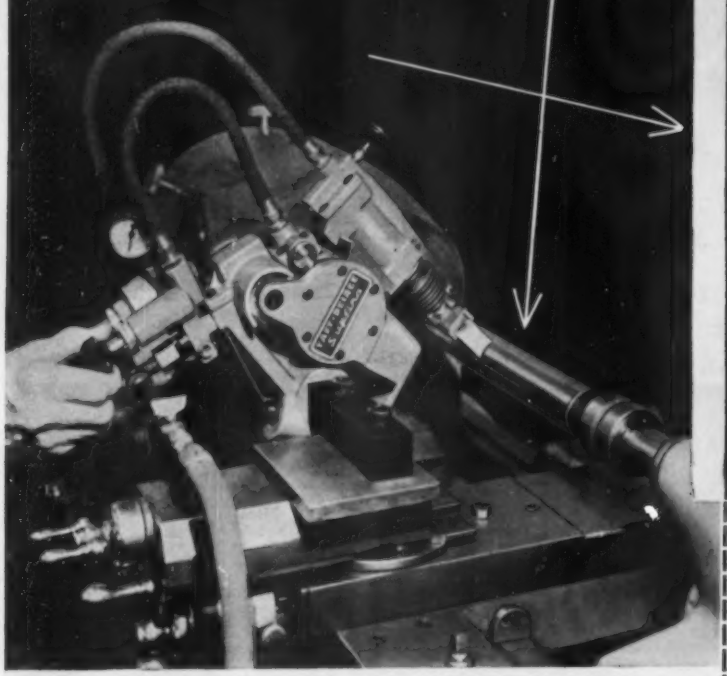
Write for free copy of Catalog No. 2011
Gives construction and engineering details

STEELWELD
PIVOTED BLADE **SHEARS**

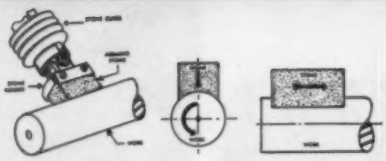
STEELWELD DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 1454 EAST 282 STREET, WICKLIFFE, OHIO

THE NEW WORD IN METALWORKING IS MICROSTONING!

NOW! SIMPLIFIED, LOW-COST CORRECTION OF SURFACE GEOMETRY WITH TAFT-PEIRCE/SUPFINA MICROSTONING



This dramatic "before and after" evidence on a Talyrond chart shows how Microstoning corrected the surface geometry of a die set guide pin. The outside trace shows an average roundness of .00028" as ground. After Microstoning (inside trace), the roundness was improved to an average of .000030"



Here's what happens . . .

Microstoning is a low-pressure, low temperature abrading process using stones of various grit sizes. Stones are placed against the work with light pressure and vibrated from 1900 to 2500 times a minute as the workpiece rotates. The stones shape themselves to the mean radius of curvature, and more pressure is applied at high spots. This produces a fast and simplified correction of surface geometry that is demonstrated graphically by the Talyrond chart above.

Microstoning with Taft-Peirce/Supfina machine tool attachments produces a controlled microinch surface finish, removes cutting tool marks and grinding flats, and dramatically improves roundness.

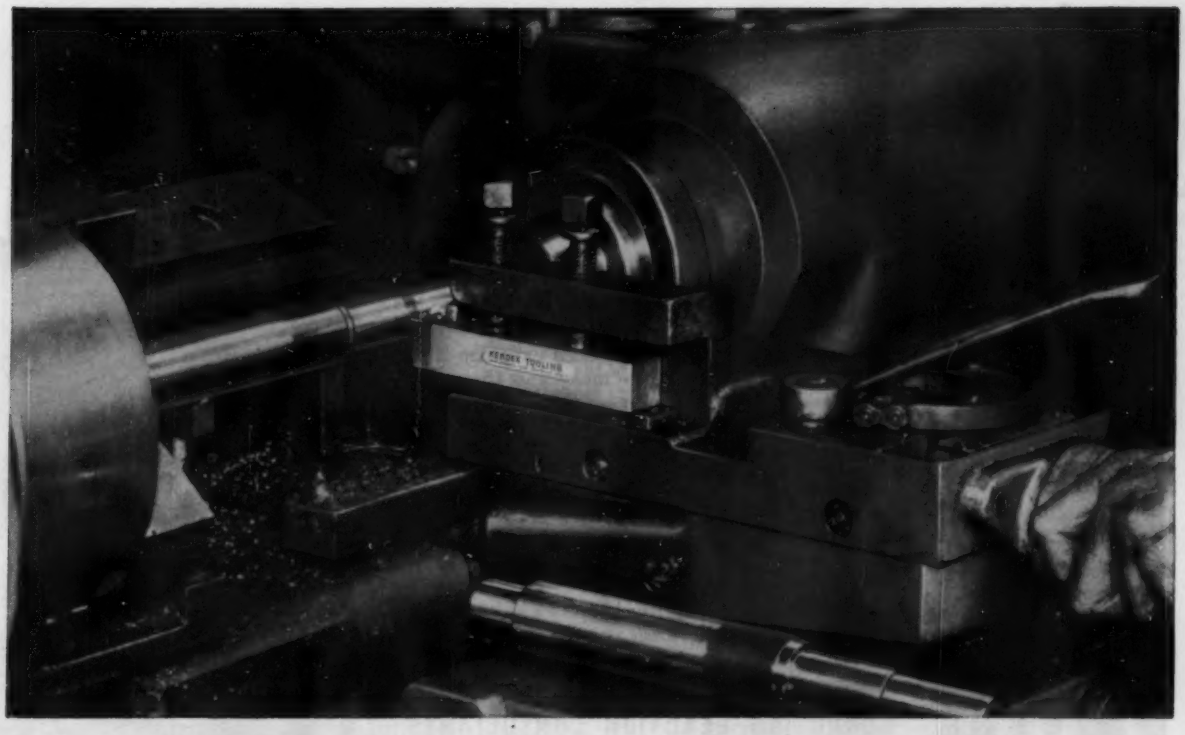
The unique, patented Supfina design makes this precision surface correction possible. A free-floating piston, driven by compressed air oscillates an abrasive stone at high frequencies against the work — to achieve both desired finish and geometric correction in ONLY ONE OPERATION! All types of metals can be microstoned as well as hard plastics and other nonmetallic materials.

Try Microstoning on your product! Taft-Peirce/Supfina Attachments are low in cost and simple to operate. They can be used on lathes, boring mills, planers and other machines — to produce a precision surface and improve the performance of spindles, sealing rings, metal processing rolls, and bearing surfaces. Microstoning can be used on both flat and round surfaces. Contact your nearest Taft-Peirce Machine Tool Dealer for full information or write direct.

Finish it with **TAFT-PEIRCE** *SUPFINA*

TPS-19

TAFT-PEIRCE MANUFACTURING CO., 13 MECHANIC AVENUE, WOONSOCKET, RHODE ISLAND



NOW KENTANIUM* K165

. . . for high-speed, precision machining

Through years of research in developing, and experience in successfully applying Kentanium, a series of titanium carbide alloys for high temperature applications, Kennametal now offers K165, a Kentanium Grade for high velocity machining.

K165 has an exceptionally high combination of hardness and strength built-in specifically for machining high temperature alloys of low machinability.

The exceptionally fine surface finish obtainable with K165, 12 rms and better, often eliminates the need for grinding. Such performance is the result of the extremely high edge-wear resistance of K165 and its low "loss of size" characteristic.

The greater combined crater/edge-wear resistance and hardness /strength of K165 permits machining at much higher speeds and with greater accuracy than attainable with conventional tungsten carbide cutting materials. It's a unique composition . . . another contribution to the art of metal-cutting from the research and engineering laboratories of Kennametal Inc.

Check the typical performance record at right. Similar operational data on other types of jobs are available from your Kennametal Representative, or KENNAMETAL INC., Latrobe, Pa.

*Trademark

97299

PERFORMANCE COMPARISON

K165 vs. Ceramic Inserts

Finish Turning Job Illustrated

	K165	Ceramic
Material	1045 steel	1045 steel
RPM	2760	2760
SFM	975	975
Feed	.0073"	.0073"
Depth of Cut	.015	.015
Pieces Per Edge	90	45
Finish		
(a) Using K165:	85 rms after 90th piece	
(b) Using Ceramic:	140 rms after 45th piece	

Note: A 45 microinch finish was produced on the first piece by both cutting materials.

INDUSTRY AND KENNAMETAL

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A simple, effective, low cost
ANTI-CORROSION TREATMENT
during storage, production and shipment

CRC

FORMULA 3-36 METALS INDUSTRY

A molecular film that first displaces moisture from grain boundaries, pores and cracks and then seals the surface against corrosive action, CRC 3-36 keeps metal surfaces new. Easily applied by spray, brush or dip, CRC 3-36 never becomes hard or brittle, normally need not be removed when metal is subsequently processed. Non-irritating and non-toxic to humans, has faint pleasant odor.

Also preserves tools, dies and fixtures, loosens "frozen" parts, has beneficial lubricating effect.

Available in 16 oz. aerosol cans for spraying; 1 and 5 gallon cans and 55 gallon drums for spraying, brushing and dipping.
CRC
3-36

WRITE TODAY!

Send for free copy of CRC 3-36 Bulletin which gives complete product specifications and describes cost-saving applications.

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Specialists in Anti-Corrosion Treatments

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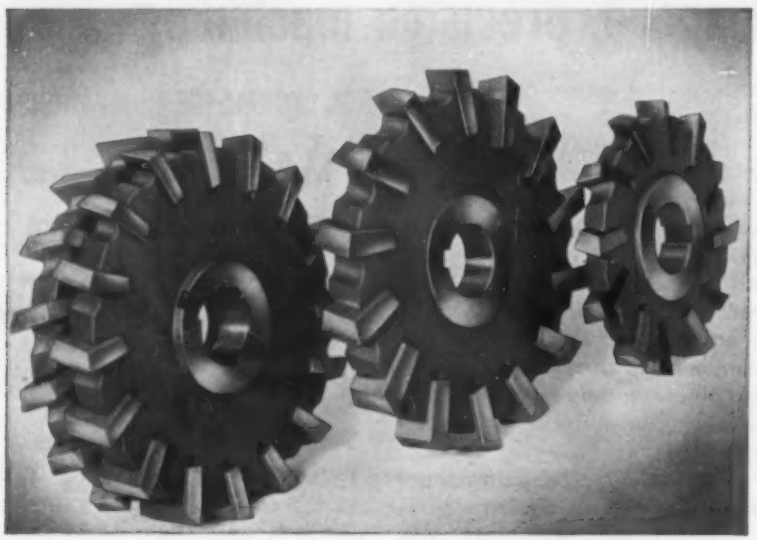
CIRCLE 313 READER SERVICE CARD



TWO HALF SIDE MILLS, GROUND AS A UNIT; SERIES 6100. HALF SIDE MILL; SERIES 6000. ALTERNATE ANGLE MILL; SERIES 6000.

ELI WHITNEY invented the milling machine in 1818

Thus he became the father of a great industry that today includes such leading manufacturers as Bullard, Bridgeport, Cincinnati, Giddings & Lewis, Kearney & Trecker, Sundstrand. O K Tool's contribution to the industry was the first milling cutter with self-locking and replaceable blades. From this gradually evolved the science of tool geometry as we know it today. Write for Catalog 13. THE O K TOOL COMPANY, INC., 400 Elm Street, Milford, N.H.

OK *modern milling cutters for modern milling machines*

"Don't tell me you forgot to order more?"

The inconvenience of running out of Jewel Brand Abrasive Belts is more than offset by the prompt service we offer on hurry-up orders. However, just to be safe, stockpile a reserve supply today.

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Belts • Rolls • Sheets • Discs • Specialties

ABRASIVE PRODUCTS, INC.

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CIRCLE 314 READER SERVICE CARD

CIRCLE 315 READER SERVICE CARD

HOW TO MEASURE SURFACE ROUGHNESS with New METROsurf*

the only battery powered surface roughness indicator

Small and light enough to hold in one hand, METROsurf is battery powered—ready for immediate use anywhere!

newest . . . smallest . . . most accurate and rugged

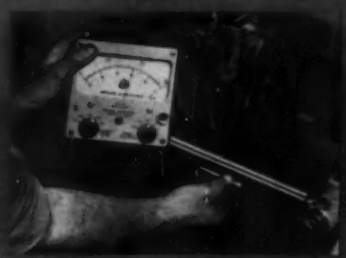
Today's precision requirements rule out "eye" or "feel" methods of checking surface finish. METRO*surf* makes it more accurate, easier and faster.

- *Quickly establishes the requirements for each job and allows faster, closer control of the operation.*
- *5 Range selections for any precision roughness measurement: 3, 10, 30, 100 and 300 microinches — full scale.*
- *Roughness width cut-off available in three ranges: .003, .010 and .030.*
- *Hand held or motor driven tracer.*
- *Long life batteries.*

METRO*surf* is manufactured by the makers of the high-reliability INCHWORM* (Micro-inch Linear Actuator), the Type 170 Electronic Gage, and the Type 160 MICRO*trol**—a control system of micro-inch accuracy readily adaptable to your machine and production requirements.

A CUTLER-HAMMER Sales engineer or gaging distributor in your area will be glad to discuss your problems of surface roughness, gaging or continuous automatic machine operations.

Call your CUTLER-HAMMER office or write for complete MICRO*trol catalog.*



Big dial shows average surface roughness in seconds right at your machine . . . without lifting or removing your work.

Measure any surface however complex—ID, OD, even gear teeth. Reach way into small, nearly inaccessible surfaces or measure across several feet of material on a production line.

*Trade Mark

Price: $495.00

AIRBORNE INSTRUMENTS LABORATORY

DEER PARK, LONG ISLAND, NEW YORK

A DIVISION OF CUTLER-HAMMER INC.

CONTROL

PERFORMANCE... wherever you need it!

Johnson Mobile Metal Cutting Band Saw—5"x10" Capacity

Johnson *MOBILE* METAL CUTTING BAND SAW

The right saw in the right place pays for itself—fast. That's why so many contractors and field crews are using the versatile Johnson Model M—Mobile Saw. The Model M eliminates all hand cutting of structural steel, pipes, conduits, angle iron, reinforcing rods—cuts anything on the job... including time and labor costs. It's mounted on big, sturdy rubber-tired wheels for complete portability—it's easy to handle and easier yet to operate. It's a natural for any contractor with metal to cut and it's built to last a lifetime—indoors or out. Take a good look at this husky Model M and order yours right now. You'll save important money right from the time your saw gets to the job!

SPECIFICATIONS

Capacity—5" rounds, 10" flats
Height (Closed)—30"
Blade Length—7' 5" x ½" x 23 ga.
Blade Speeds—45, 90 and 150 ft. per min.
Floor and Ground Space—46" x 28"
Drive Wheels—10" diameter
Motor—½ H.P.—any voltage with 25' ext. cord
Traction Wheels — Solid, rubber tread, 12" dia.
Weight—300 lbs.

Johnson MANUFACTURING CORPORATION
... 1017 Barnes St. Albion, Michigan

WRITE TODAY... for your free copy of the big illustrated Johnson Saw Catalog

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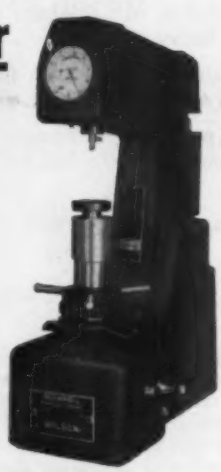
CIRCLE 317 READER SERVICE CARD

One of these Wilson "Rockwell" instruments will do your hardness testing job



No matter what your hardness testing requirements are, there's a Wilson "Rockwell" tester to do the job. Choose from this complete selection of hardness testing equipment:

"Rockwell" Hardness Tester—for most hardness testing functions.

"Rockwell" Superficial Tester—for extremely shallow indentations.

TwinTester—Combines functions of "Rockwell" and "Rockwell" Superficial testers.

Semi and Fully Automatic—for high-speed testing, at rates up to 1,000 pieces per hour. Automatically classifies pieces as CORRECT, TOO HARD, or TOO SOFT.

Special Machines—for testing large objects, internal readings, and other unusual applications.

Diamond "Brale" Penetrators—Flawless diamonds, individually calibrated, and highest quality construction assure perfect testing every time.

Write for Bulletin RT-58

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Wilson Mechanical Instrument Division
American Chain & Cable Company, Inc.
230-8 Park Avenue, New York 17, New York

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It's not enough to tell you Jewel Brand Abrasive Belts are "fast cutting, cool running, and long lasting". They *are* . . . but the best way to prove *all* their advantages is on the job. Give them a "show me" run soon!

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Belts • Rolls • Sheets • Discs • Specialties

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CIRCLE 318 READER SERVICE CARD

CIRCLE 319 READER SERVICE CARD

There's a WESPO clamp or plier for every clamping job!

80 models and sizes...

made better three ways to give more positive holding, last longer!

1 Reamed holes
2 Hardened serrated bushings
3 High tensile strength rivets

send for free catalogs describing Wespo clamps and fixture details

WESPO DIVISION
VLIER ENGINEERING CORPORATION
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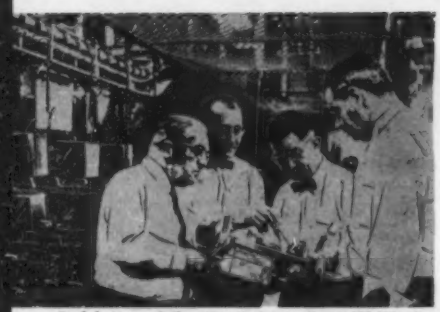
A metalworking manufacturing report for advertisers

Plan session. Manufacturing management team at Royal McBee's Hartford plant reviews plans for new unitized assembly operation, next major step in cost reduction program. L. to R.: Earl W. Gosloe, chief industrial engineer; Harold E. Tulloch, manufacturing superintendent; Donald Flannery, chief equipment engineer; Edward J. Brann, chief production engineer; Thomas W. Turner, chief tool engineer; and Lee MacFeiggan, production manager. (Chief methods engineer Frank Peisheck was unable to attend.)



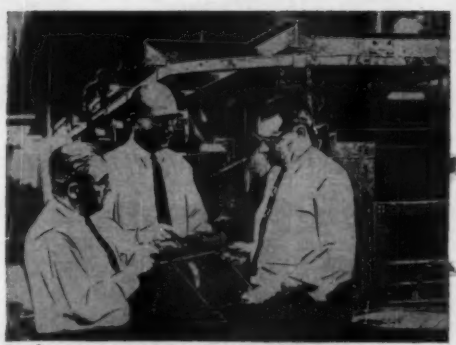
Push-button painting. New "paint shop" uses 100,000 volts of static electricity to magnetize atomized paint, attract it to metal parts. Ransburg machines up production 100%; stop paint waste; save labor; provide superior finish. Earl Gosloe, junior foreman Joe Hacia, Harold Tulloch and Don Flannery check finish as typewriter frames move from electrostatic paint booth to bake ovens.

Versatile, "more talented" business machines... constant challenge for

the brains behind Royal McBee's typewriter that thinks

Metalworking manufacturing team saves $3 million in two years by being alert to new ideas.

Typewriter-character blanks—10,000 of them an hour—punched out by press that saves $6,000 a year. Old method (at 3,000 an hour) used 4" steel bars; new process feeds continuous ribbon of steel from a coil. Junior foreman Stanley Zavatsky, George Colwick and Harold Tulloch huddle over handful of the parts.



Tougher, longer-wearing type bars for high-speed electric typewriters are inspected by Earl Gosloe, Lee MacFeiggan, Don Flannery. New automatic austempering installation doubles production (heat treats 14,000 type bars per hour), eliminates distortion and need for roll straightening, minimizes rejects, reduces labor and material costs.

How do you make an electric typewriter think for itself? Tab automatically (both vertically and horizontally)? Handle an entire billing operation at the push of a button? And how do you manufacture it of stronger, tougher, better parts—and save millions in the bargain?

This is the kind of continuing challenge that drives Royal McBee's manufacturing team—a group of optimists who believe that "making changes is important." The changes involved in producing the "typewriter that thinks" ranged from new methods of cold heading to heat treating . . . from systems for zinc die-casting to multiple paint spraying . . . from new machines for rod-straightening to spring-winding. And these are only a few of the dozens of cost-cutting improvements that enabled Royal McBee to bring out six major new products this year—at savings running into the millions.

Every other Monday, some 42,000 metalworking manufacturing men—like the team at Royal McBee—turn to American Machinist/Metalworking Manufacturing as a source book for new ideas, new materials, new machines in their continuing search for better, less costly ways to make things of metal. If your product can help them, give them the facts in AM/MM. They read it with their eyes and minds wide open, ready to buy. That's why it is the most direct, efficient, and effective way of selling to metalworking.

One machine now does the work of five operations. New Kingsbury machine drills, taps, and reams . . . delivers 194 escapement frames per hour vs. 25 by old method at $70,000 annual saving. Here, frames are examined as they come off automatic machine by Harold Tulloch, Ed Brann, process engineering supervisor George H. Colwick and Earl Gosine.

If your product is sold to metalworking, your advertising belongs in

American Machinist / ***Metalworking Manufacturing***

A McGRAW-HILL PUBLICATION • 33 WEST 42nd STREET, NEW YORK 36, N.Y.

VIP*

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A man's ability to grow, his job satisfaction,-his performance for you . . . yes, your company's future earnings . . . are all intimately related to the amount of practical, profitable information he is continuously absorbing, and putting to use in his daily job. Today, demands are such that a successful man must be better informed than ever before . . . and successful men make successful companies. This is why the McGraw-Hill V I P Program of "engineered" business reading will give you so much personal satisfaction in your plans to move your company forward. If you are concerned with man-power development, you will want to read this new booklet, learn from other leaders now using this program. Write for your personal copy. . . .

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7. Broaching Machines
13. Cutting Off Machines
16. Drilling & Reaming Machines
23. Gear Cutting Machines
24. Grinding Machines
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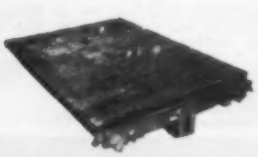

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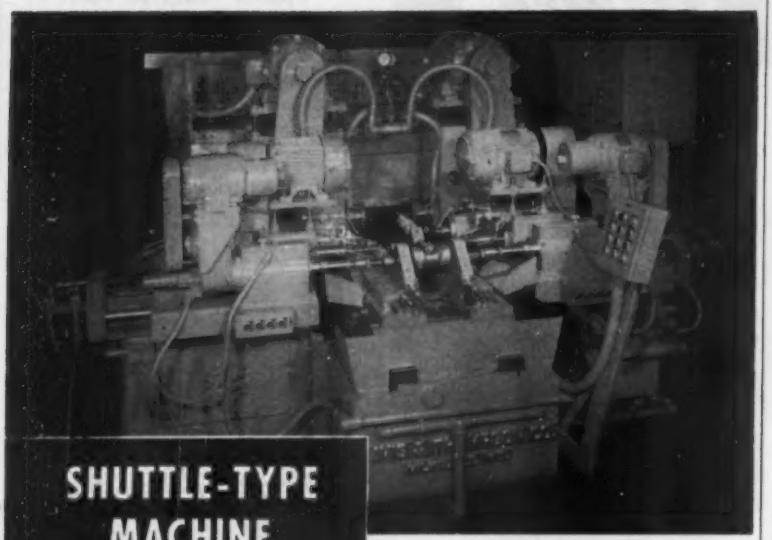

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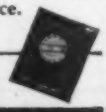

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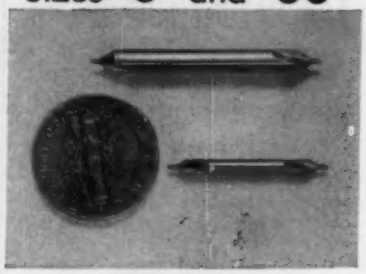

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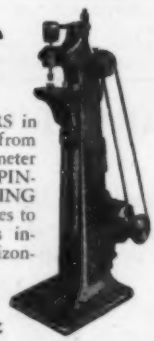

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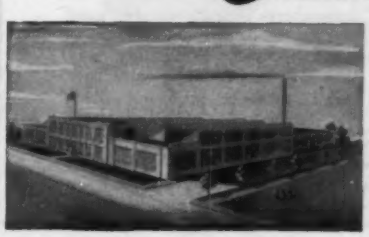

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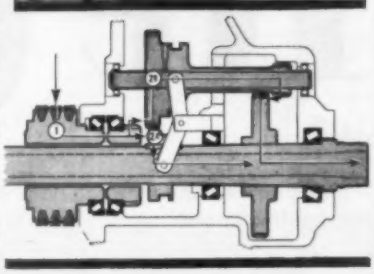
"Free Running" spindle (Patent Pending) has no drive pressures to cause deflection. (See cut-out below.)



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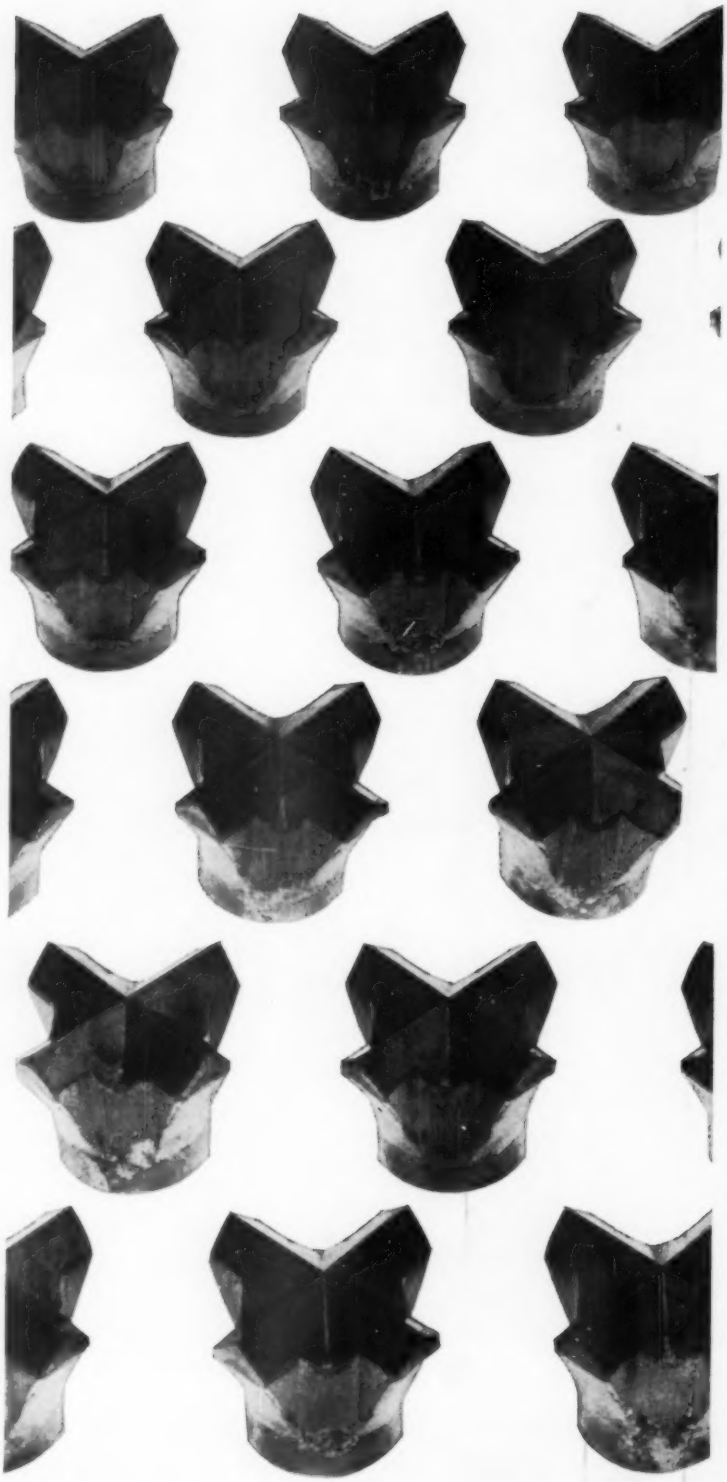

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